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COLONEL THOMAS H. GOODWIN, C. M. G., D. S. O.
Royal Army Medical Corps

THE
MILITARY SURGEON
VOL. XLI OCTOBER, 1917 NUMBER 4

ORIGINAL ARTICLES

Authors alone are responsible for the opinions expressed in their contributions

SANITATION IN WAR

BY COLONEL T. H. GOODWIN, C. M. G., D. S. O., R. A. M. C.,

I PROPOSE to consider such matters as have affected us in the present campaign and shall briefly indicate the lessons which we have learned and the modifications which experience has induced us to introduce.

The sanitary organization of units in the field is as follows:

Water Duty Men.—One noncommissioned officer and four men, R. A. M. C., are attached to each infantry battalion, and proportionate numbers are attached to other units. This detachment is for "water duty." Our field service regulations (Part I) provide that eight men per battalion should be specially detailed, when required, for duties connected with the provision of a pure water supply.

In addition to these "water duty" men a "sanitary detachment," consisting of one noncommissioned officer and eight men, is furnished from the ranks of the battalion for sanitary duties. The men of this detachment wear a badge "S. P." (sanitary police) on the arm, and have all the authority of military police. They work under the supervision and direction of the regimental medical officer and carry out such duties as the preparation and care of latrines and urinals, the collection and disposal of refuse, construction of ablution places, sanitation of cooking places, slaughtering places, horse lines, etc.

The Sanitary Squad consists of one sergeant and five privates, R. A. M. C. One such squad is allotted to each road or railway post on the lines of communication.

Sanitary Section.—This unit consists of one officer and twenty-five personnel, R. A. M. C., and its extremely important duties have been dealt with in a previous paper.[1] There is a sanitary officer (Royal Army Medical Corps) with the headquarters of each division, corps and army, and there are specialist sanitary officers at all the bases, who are furnished with fully equipped laboratories.

[1] THE MILITARY SURGEON, Vol. xli, p. 35.

There is also a mobile motor laboratory with each army, so that specimens, such as swabs from the nares of possible meningitis cases, samples of water, etc., can be quickly examined and reported on.

Let us now consider the method by which sanitation is carried out from the front line to the base.

(*a*) *In the Trenches.* (1) *Food.*—The rations are brought up as far forward as may be feasible, usually to the brigade headquarters in horse wagons or motor lorries, thence the food is distributed by hand carriage to the regimental headquarters, which is usually situated in a dugout; the food is cooked in dugout kitchens situated in this vicinity and carried thence by hand, in jacketed hot boxes, to the trenches in the firing line.

There are stoves in the dugout trenches in which a certain amount of cooking can be done and where socks, etc., can be dried.

2. *Water.*—The men in the trenches have their water bottles which are replenished from a supply of water brought up by hand in petrol tins from tanks situated probably in the vicinity of the regimental headquarters.

3. *Conservancy.*—During the earlier stages of trench warfare disposal of excreta was carried out in a somewhat primitive manner, but the long continuance of this mode of warfare has led to many modifications and improvements which we shall now consider. In the beginning there was a trench within a trench. The feces were buried in latrine trenches dug as offshoots from the trench system.

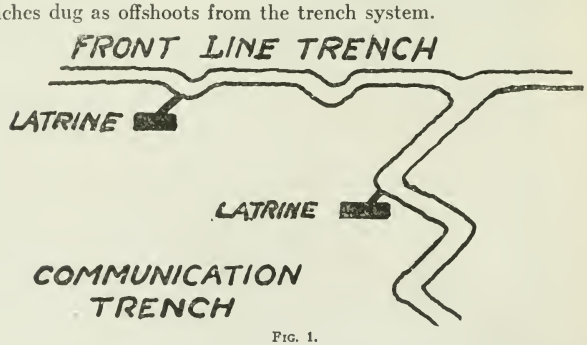


Fig. 1.

The objections to this plan are that the trenches might be occupied for a very considerable period, fresh latrine trenches would constantly require to be dug, and the extent of soil pollution after an occupation of some months may readily be imagined. Then after a heavy rainfall the latrines were liable to become flooded, with a consequent conversion

of the greater part of the trench system into a latrine. Following this we constructed a filth trench behind rising ground or other shelter and approached by a traverse trench cut as an offshoot from the main trench system. (Fig. 2.)

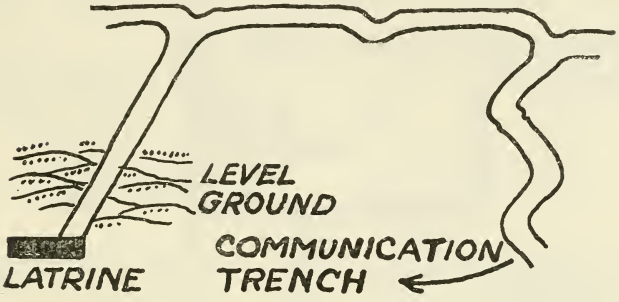


FIG. 2.

Finally we adopted the removal system in which buckets are placed in bomb-proof dugouts in the trenches.[2] The buckets are removed by the troops who are being relieved, who bury the contents in a deep trench dug for the purpose some distance, probably several hundred yards behind. The empty buckets are brought up by the next relieving troops, and are meanwhile replaced in the latrines by spare buckets on the spot.

The difficulties of this plan are most evident in low-lying ground but can usually be overcome, as the position for the deep burial trench can be selected according to the lie of the ground. Types of "bucket" latrines for use in trench conservancy are most commonly a galvanized iron box, fitted with a sliding tin cover and two removable "shafts" for carriage. This requires to be specially constructed. (Fig. 3.) A kerosine oil tin, fitted with rope handles and a wooden cover, inside a

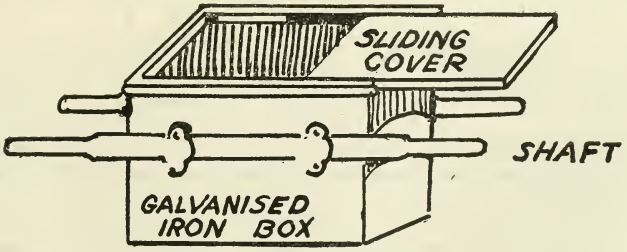


FIG. 3.

[2]See THE MILITARY SURGEON, Vol. xli, p. 354.

wooden box with a hinged lid, or simply with a removable cover,[3] have satisfactorily met the situation. On similar principles good bucket latrines can beimprovised out of cresol drums or other receptacles. (Fig. 3*a*.)

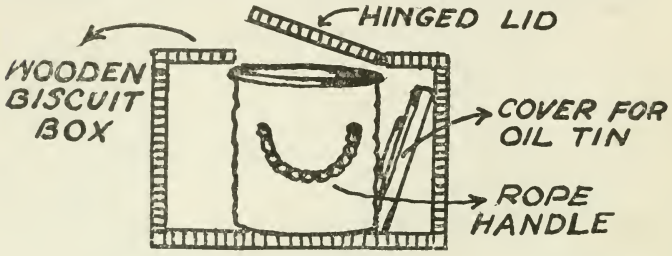


FIG. 3*a*.

The following combined incinerator and deep filth trench has been used with satisfactory results. (Fig. 4.) The lid is lifted and the latrine buckets are emptied into the trench by the party of men relieved from the trenches. Every morning some straw, waste paper, rubbish, etc., are thrown into the trench and set on fire; burning usually lasts for a couple of hours. By this method a considerable quantity of the

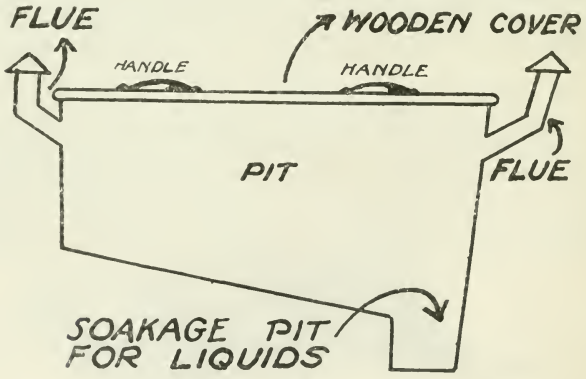


FIG. 4.

excreta is burned, the more liquid portion gravitating to the soakage pit. The trench is fly-proof and lasts for a considerable time before being filled in.

Conservancy in Hutted and Tented Camps.—Disposal of excreta formerly was by burial. Fecal trenches, long and deep, are objectionable

[3] *Ibid.*, Vol. xli, p. 354.

because of fouling of ground. Narrow and shallow (straddle) trenches, 3 feet long, 2 feet deep, 1 foot wide, of which allow 5 to every 100 men, or, if the number of troops is 500 or over, allow 3 per cent. The frontage in yards is six times the number of hundreds of men, *e. g.*, 200 men require 12 yards of latrine frontage. If such trenches are used a notice as follows: "After using this latrine throw some loose earth in the trench," should be posted in front of each set of trenches. A hand scoop should invariably be provided at each latrine. This method is particularly applicable to temporary camps.

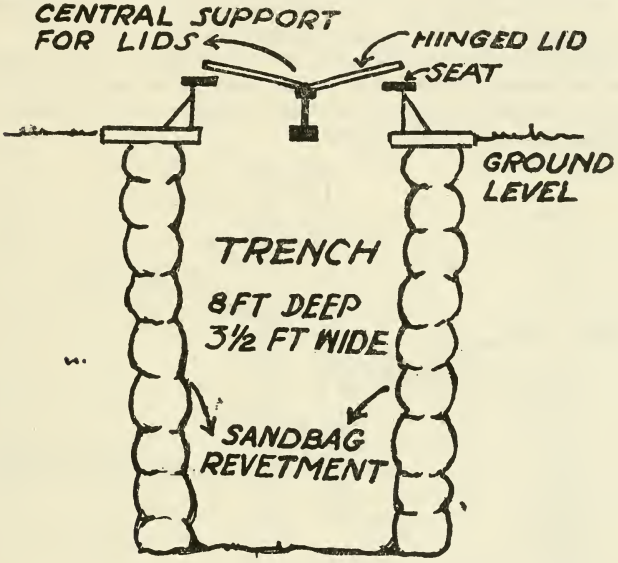


FIG. 5.

Nowadays either a removal system of bucket or box latrines or a deep-trench fly-proof latrine is used entirely. The removal system has already been described when dealing with sanitation in the trenches, the deep-trench fly-proof latrine is made as shown in Fig. 5. Latrine trenches should be situated where no contamination of water supply is possible, and not less than 100 yards from, and to leeward of, kitchens. The trench contents and surroundings should be sprinkled with a 5 per cent solution of cresol, to keep off flies.

A combined method of incineration and burial has already been described, and this principle may readily be applied to latrines. In-

cineration presents many difficulties, not the least of which is the provision of fuel. One thousand men provide 100 pounds of solid and 500 pounds of liquid excreta per diem; if sawdust is obtainable some 50 or 60 pounds of this, with dry horse litter, will be found sufficient fuel to incinerate the solid excreta.

Incinerators.—Are of the open and closed types. The objections to the former are that they are slow to make and start, wasteful of fuel, productive of offense, liable to be put out by rain, and contents may be blown over camp.

Of the latter (closed types) various more or less improvised patterns may be made of brick, galvanized iron, etc.

Field Destructor.—The following illustration (Fig. 6) shows a destructor which has 16 cubic feet furnace capacity and should suffice to destroy the total excreta of a unit 1,000 strong in ten hours. Urine is usually disposed of in soakage pits.

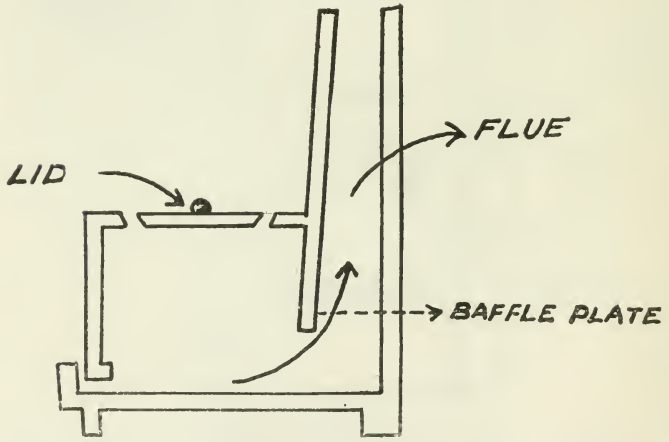


FIG. 6.

Fly-proof latrines should be employed wherever possible. The shallow, open latrine trench is a standing danger. Chloride of lime does *not* exclude flies from latrines. A solution of 5 per cent cresol, or equal parts 5 per cent cresol and paraffin, will act as deterrents, and the latrine seats and trenches should be daily sprinkled or sprayed with such a solution.

For kitchen refuse a covered receptacle should be provided immediately outside each kitchen, for the reception of all refuse, and the contents should be removed from this to the incinerator twice daily or

oftener if necessary. A tin or box should similarly be placed outside each tent or hut for the collection of food fragments or refuse.

No caps or other clothing should be hung up or kept in the kitchen. The cooks should be provided with clean aprons. The following notice should be posted in every kitchen: "All food must be kept covered from flies. All refuse must be immediately removed from the kitchen and placed in the receptacle outside."

A basin of water, with soap and towels, should be always at hand just outside the kitchen in order that the cooks and their assistants may have every facility for keeping their hands clean.

Meat safes should always be provided; these can readily be made from boxes, muslin bags, etc. Half empty tins of jam and pieces of cheese must not be left exposed in the kitchen or food stores.

Water.—Each man in the field requires daily the following amount of water: In camps, 3 gallons. An additional 2 gallons per head per diem will be required if clothing is washed. In bivouacs, etc., for drinking and cooking only, 1 gallon.

Examination of Water Sources—Wells.—Note as to whether the well is protected by lining by stone, brick, etc., provision of a cover, coping around edge, provision of a pump, sufficiency of depth (so as to insure filtration. *Springs.*—"Land" springs. In these the water flows above an impermeable stratum. Should be regarded with suspicion. "Main" springs—underground reservoirs beneath impermeable strata. *Streams.*—Liable to contamination. The motor laboratories, already mentioned, have proved of immense service in carrying out rapid and efficient bacteriological examination of water supplies. In the British Army we no longer rely on the "filter watercarts" as being an effective filtering agent, and we now use the cart simply as a movable tank or water container. Care must be taken that the interior of these carts be kept scrupulously clean by frequent scouring with a solution of chloride of lime.

The method of water distribution and purification on the western front is now carried out as follows: Water is conveyed by pipes to various "water points," situated throughout the area of operations. Tanks are established at these "water points" from which the water carts are filled. The water is sterilized by the addition of a definite quantity of chloride of lime, the amount to be added varying with the nature of the particular water supply.

Flies.—The importance of flies as potential carriers of disease is already well known. As Mr. Gordon Hewitt remarks, "the housefly is a winged and wandering bundle of bacteria." The *eggs* hatch in from eight hours to four days into larvae or maggots, which exist as

such for two to three days and then enter into the stage of the pupa or chrysalis, which, after five to seven days, hatches into the mature fly. The fly becomes sexually mature in ten to fourteen days, after having been hatched. Four days after mating, the females lay their eggs in batches of about 120 and each may lay five or six such batches during her life. "In very hot weather, the progeny of a fly may be laying eggs in about three weeks after the eggs from which they were hatched had been deposited" (Hewitt).

When a fly feeds, it moistens and renders soluble the substance, by discharging on it a flow of saliva; it also regurgitates a portion of the previously swallowed meal. Flies can travel up to a mile from their hatching places.

Protective Measures.—Destruction or protection of infected material, *e. g.*, rendering of the latrines fly-proof, early destruction of all infected material. Anti-fly measures.—Prevention of fly-breeding; prevention of access of flies to human excreta; destruction of flies; protection of food. We will now consider each of these measures:

Prevention of Fly-breeding.—Attack the breeding grounds. Moist stable litter and horse-dung or human excreta form the favorite media for the deposition of the eggs. The use of *chemicals* is generally impracticable on active service.

Incineration.—So far as possible, each day's horse-manure should be burned within twenty-four hours. It is difficult to carry this out satisfactorily in wet weather, especially when large quantities of manure have to be dealt with. Where the quantity is not excessive, the greater portion or all may be completely burned by the use of iron-frame incinerators.[4] Where large heaps of horse-litter exist, much may be effected by raking the surface and edges daily, and burning as much as possible.

House-fly larvae will not tolerate a temperature of 100° F., and both larvae and eggs are quickly killed at any temperature above 114° F. The heat generated by closely packed stable manure is usually 130° F. or higher. Taking advantages of this fact, we make the manure into closely packed "dumps" on hard ground—the surface of the smooth, hard ground should extend 3 to 4 feet beyond the edges of the "dump." As fresh manure is added, it should be firmly beaten down and the surface smoothed with shovels, water being added, if necessary.

In hot, dry climates, such as India, manure may be quickly desiccated, and any larvae or eggs which it contains killed by spreading it in thin layers on the ground and so exposing to the sun. This method is not applicable on the western front.

[4] *Ibid*, Vol. xl, p. 505

Destruction of Flies.—Fly traps of various patterns are comparatively easy to improvise.[5]

The bottom bar of the trap frame is raised one-half inch from the surface of the platform. From the bottom bar, a wire gauze flange, 4 inches wide, projects inward all around, sloping downward so that the inner edge is one-quarter inch from the platform.

Some bait should be placed on the center of the platform under the trap. When a sufficient number of flies are caught, they may be killed by petrol fumes or other means.

"Tangle foot" may be made by heating 5 parts (by weight) of castor oil and 8 parts (by weight) of powdered resin until the resin is completely dissolved; do not let the mixture boil, but apply hot, as thinly as possible to glazed paper, wire or hoop-iron.

Fly poisons are sodium arsenite, 15½ grains dissolved by heating in 3½ ounces of water and 25 per cent sugar added. Expose this solution in tin trays (taking proper precautions) in suitable situations. Pads of cotton wool should be placed in the trays and these pads moistened as they become dry. Formalin.—Add 3 per cent formalin to sweetened milk and water; expose in saucers with a cube of bread in the center. Sprays.—"Cinol," "exol," etc., containing extract of "pyrethrum." Fumes.—Burning pyrethrum powder quickly stupefies both flies and mosquitoes in a room. Fumes of petrol have a similar effect. The burning of equal parts of phenol and camphor, 4 ounces per 1,000 cubic feet, quickly kills all the flies in the room, the apertures all being first closed.

Where possible, kitchens and dining rooms should be made fly-proof by double-wire gauze doors with a short corridor between. All food should be kept covered from flies by "safes" or similar means. Cheese, sugar and jam are frequently overlooked in this respect.

The body-louse has been an unmitigated and almost universal pest during the present campaign. Lice carry the virus of typhoid fever, relapsing fever and probably the so-called "trench fever."

Life History.—The female louse lays 5 eggs at one sitting and may produce a total of 125 eggs. The eggs are usually laid in the body-clothing, especially at the seams, and as a rule hatch in six to twelve days, but the hatching may be delayed for as long as six weeks if the conditions are unfavorable. Sixteen days after having been hatched, the female louse may commence to lay eggs. The louse probably lives seven to eight weeks but cannot survive separation from the human body for more than nine days.

The sources of infestation are living places, blankets, straw, etc.,

[5] *Ibid.* Vol. xli, p. 255.

personal clothing. The last named is infinitely the most important.

The means of prevention and destruction are personal cleanliness. The battalion medical officer should inspect the men of his unit at least once weekly. Baths, disinfection and the washing of clothes must be carried out on every possible occasion. Laundries are now established in every area and the clothing before being taken to the laundry is disinfected either by means of Thresh's disinfector, or by the Clayton machine (sulphurous acid). Heat.—Boiling water and steam kill the lice instantly and the eggs in 1½ minutes. The heat at which a flat iron is normally used kills lice and eggs instantly. Liquids. —Immersion in one-half per cent cresol kills lice and eggs within an hour. Powders.—"N. C. I." powder, napthaline, 96 per cent; creosote, 2 per cent; iodoform, 2 per cent. This powder is an effective killing agent but it is irritating, and on this account should not be used too freely, especially in the region of the fork. Keating's powder, "pyrethrum," is not very efficacious, although better than nothing. The following ointment is effective: "Vermijelli," crude mineral oil, 9 parts; soft soap, 5 parts; and water, 1 part. This should be smeared once weekly on all inner seams of the clothing. Crude oil ointment is also of use. Melt 2 pounds of soft paraffin and add 4 ounces of crude tar oil. This is reported to be more efficacious than "vermijelli" and should be used in a similar manner.

Summary.—Disinfection and washing of the clothing should be done whenever opportunity occurs, *e. g.*, when division is relieved from trench and comes into a "rest area." Application of crude oil ointment and "N. C. I." powder should be made every four days.

Baths.—Each division should institute at least one bath, capable of dealing with 1,000 men per diem. Most divisions can now arrange to bathe at least 2,000 men per diem. The object to be aimed at is that the man should "shed" his entire clothing, have a satisfactory hot bath, clothe himself in fresh washed and disinfected clothing and return to his billet, with disinfected blankets. If these objects are attained, such a man should, on return to his billet, be perfectly clean and his clothing and bedding entirely free from vermin.[6]

Infectious Diseases.—These require to be constantly watched for and guarded against. It is by early detection and prompt action that an outbreak which may have serious and far-reaching consequences should be prevented. Any suspicious cases should be at once isolated until diagnosis is confirmed, either positively or negatively. All "contacts" must be segregated. "Carriers" must be carefully watched for. The following are the chief diseases in which apparently healthy "carriers" may spread the disease: Typhoid, para-typhoid, dysentery, diphtheria,

[6] *Ibid*, Vol. xxxix, p. 714.

cholera, cerebrospinal meningitis. No men who have recently suffered from enteric fever or dysentery should be employed at "water points" or in kitchens. Men suffering from diarrhea should be early placed under close observation.

Cerebrospinal Meningitis.—On the occurrence of a suspicious case, the patient must be at once isolated and placed under treatment. His clothing, bedding and quarters must be disinfected. All "contacts" are to be segregated in well-ventilated quarters. Swabs from the naso-pharynx should be taken in the case of each "contact" and sent to the mobile bacteriological, or other laboratory for examination. Pending the result of this examination, the men should be treated by nasal insufflation and gargles twice daily. Those in whom the results are negative, and whose throats are normal, may return to duty. Any who are reported as "carriers" should be transferred to other quarters, and isolated until two successive swabs taken from the naso-pharynx, at intervals of several days, are reported as negative.

Method of Taking the Swabs.—The swabs should be as free as possible from saliva, and cultures should be made as quickly as possible. In order to carry out the first desideratum, a covered swab-carrier, such as West's, should be used. The covering tube carrying the swab is passed behind the soft palate, the swab is extruded so as to come in contact with the naso-pharynx, and is then drawn back within the covering tube and both are withdrawn from the mouth.

I trust that the foregoing may convey some of the conviction which we officers of the R. A. M. C. feel as to the immense importance of sanitation in an army in the field. The last twelve years' sanitary efforts have shown greatly improved results in our army. As an example, I might quote the case of our army in India: From 1903 to 1912 the following results were obtained: The enteric death rate fell to less than 9 per cent of the 1903 rate, the invaliding rate fell to less than 23 per cent, total death rate fell to less than 35 per cent, and constantly sick rate fell to less than 46 per cent. These figures represent an actual annual saving of 100 lives, 1,500 invalided from the service, 2,300 average sick in the hospitals.

As regards cholera, in 1869 we had 972 deaths amongst the British soldiers from this disease. In 1912, with a much larger army, we had 14 deaths. Anti-typhoid inoculation is voluntary in our army, but the belief in its efficacy is so general that in 1913 over 90 per cent of the British troops in India had been inoculated. We have numerous instances in history of the disastrous condition to which an army may be brought by disease, and it is only by constant and unremitting effort that incidence of disease can be kept at a uniformly low level.

BATH, DISINFECTION TRAINS AND FIELD LAUNDRIES OF THE AUSTRO-HUNGARIAN ARMY

By Colonel JOSEPH H. FORD

Medical Corps, United States Army; Military Observer

(With fifteen illustrations)

THE conditions under which men fought on the eastern front were such that facilities for obtaining baths or keeping the body free of vermin were quite unsatisfactory. Cleanliness of body and clothing was prevented by the necessity of living constantly in the trenches, and probabilities of infection resulted from the fact that vermin were found in many of the peasant huts where some men were billeted. In order to ameliorate these conditions ten baths and disinfection trains were organized (Badezuge), which proceeded to those points nearest the front where they would be most accessible to the troops. They remained at such points about two days each and the troops visited them by roster.

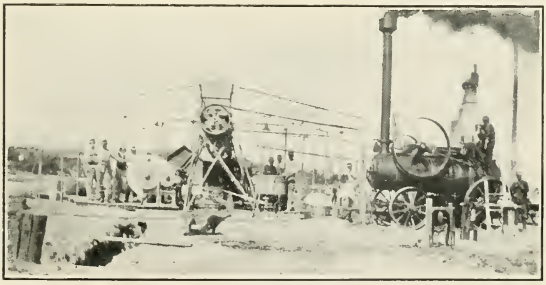
One such train inspected consisted of two engines and nineteen cars. One engine was employed for traction purposes, the other chiefly to pump water and to develop steam to heat bath water or to fill the sterilizing chambers. Two cars were used for the personnel, five carried supplies used by the train, viz.: soap, towels, 10,000 complete outfits of clean clothing, naphthalin ointment (10 per cent in vaseline), scrubbing and nail brushes, etc. The supplies were arranged systematically on broad shelves along the sides of the cars. The clothing, which was intented for the temporary use of the bathers while their own clothing was being disinfected, consisted of all the articles worn by the troops, including underwear, caps, overcoats, shoes, etc. Two cars were tank cars which formerly had been used to carry wood alcohol. The capacity of each was 75,000 liters. They were connected by water and steam pipes to the engines, and by outflow water pipes with the bathing cars.

Each tank was boarded in, but two apertures, usually closed by doors, were left in the side of the wooden cover. By one of these doors an operative could gain access to the tank. The other protected the steam gauge, thermometer, and the stop cocks which regulated the inflow of water and steam, and the outflow of water. These tanks held enough water to supply the train for two days.

Three cars, especially built for the purpose, were used for disinfecting purposes. Each consisted of two chambers, made of sheet iron and was airtight to a pressure of 10 atmospheres. Each compartment

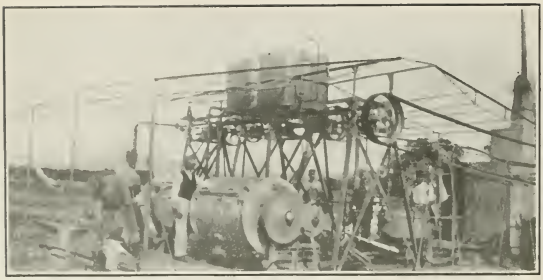
Tents Housing Sewing Machines and for Sorting and Packing of Clothing.

Laundry with Tentage spread over Framework.

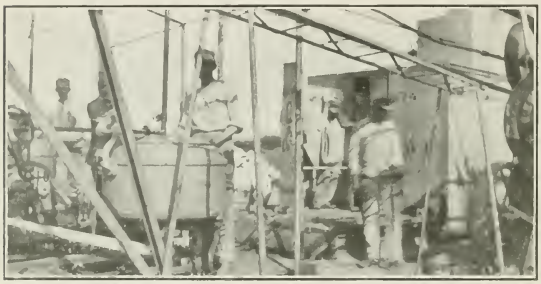


Field Laundry Showing Frame for Tent (Steel), Self-Propelling-Engine, Mangle, on Left; Centrifugal Drying Machine; and Tank on Framework.

(To face page 388.)



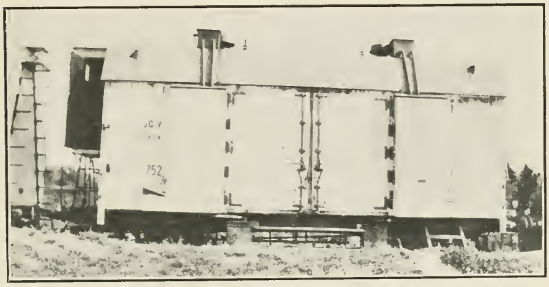
Tank, Mangle, Centrifugal Drier and Closets for Further Drying by Steam in Their Walls.



Centrifugal Drier and Steam Drying Closets.

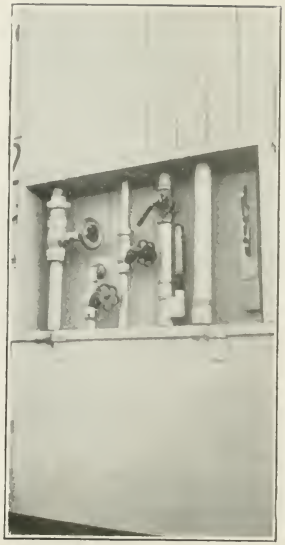
Steam Drying Closet.

Bathing Car, showing Tank on Roof and Glazing of Windows with Frosted Glass.



Car for Disinfecting Clothing.

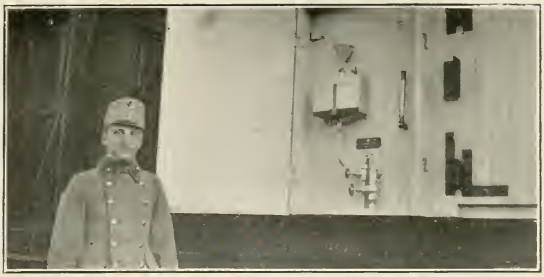
Bathing Car.



Control of Disinfection by Steam Alone, in Disinfecting Car.

Control of Water Supply in Bathing Car.

Dressing Car. Bathing Car Behind.



Stop Cocks, Etc., Controlling Steam and Formalin into Disinfecting Car, Thermometer Shown.

Another View of Bath Train.

Tank Cars for Bath Train. Behind Them Three Cars for Disinfecting Clothing. In Rear Two Day Coaches Equipped with Bunks for Train Personnel.

had a capacity of 1,400 cubic meters and was provided with ceiling hooks, and wall hooks, while the walls and floors were corrugated by strips of wood, the general structure being that of an autoclave. In one of these cars underclothing was disinfected for half an hour by steam, at 103° C., under a pressure of 10 atmospheres. In two cars leather goods (including shoes), furs, caps, overcoats, and outer clothing, were disinfected by steam for five hours, at 60° C., under a pressure of 10 atmospheres, or by formaldehyde[1] for five or six hours, or by sulphur dioxide for five hours, at from 300° to 500° C.

Five cars belonged to the bathing section. One long car, in the middle of this section, accommodated sixty men at a time, who undressed in it. They left all their effects here, and separated into two sections of thirty men each, each man receiving a number corresponding to that fastened to the loosely woven sacks in which his clothes were placed by one of the train attendants. One section proceeded into the bathing car ahead, the other into the bathing car behind. Each of these cars had a tank holding 5,000 gallons on the roof and was equipped with thirty showers, each supplying 25 liters of water in 5 minutes—the time allowed for the bath. Water was turned on through a convenient faucet by an attendant who regulated the temperature by stop cocks. A thermometer, connected with the outflow pipe into the spray heads, indicated the temperature. Usually water was delivered at a temperature of 36° C. A cake of soap and a towel were placed in a convenient place near each spray head. The walls of the bathing cars were covered by "Cyliott," a smooth water proof composition made in part of concrete. The floors were transversed longitudinally by strips of corrugated boards, each corrugation about 1 inch wide and 1½ inches high. Gutters ran along the walls of the car and water was discharged by a scupper in each corner. The floors of other cars of the bathing section were made of cement. The car was well lighted through large glazed windows and by ceiling electric lights, which were noted in all the cars in the bathing section of the train. Usually from 1,400 to 2,000 men bathed daily, but the number had been increased to 3,600 in emergencies. After the bath the men rubbed the body generally, and hairy surfaces especially, with an ointment consisting of 10 per cent naphthalin in vaseline. This ointment was provided in jars, 1 foot high and 6 inches in diameter, placed in each corner of the car.

After using the ointment the bathers went into the next car where, on two benches extending its entire length, were laid out in individual piles all the articles of clothing necessary for each man, from shoes to

[1] The formaldehyde used for disinfection was developed by boiling formalin, 14 liters for each compartment.

cap, including underwear, overcoats, etc. They used these articles until their own were returned to them about six hours later.

The personnel of the train consisted of one second lieutenant, seventeen operatives, and six men of the train crew.

These bath trains gave very satisfactory results in so far as they promoted the comfort of the troops and freed them of vermin, but their usefulness was so restricted by the limitations of their movements that an attempt was made to replace them by automobile columns provided with similar equipment. This, however, was only partially successful, for auto trucks were urgently needed for supply purposes, and the fact that typhus was not prevalent in the Austrian army was another alleged reason why auto disinfection trains were not established. Another defect of the bath train was its weight, and the consequent great quantity of fuel it employed when traversing, or operating in, mountainous regions. However, it proved of great and definite value at a time when the army was threatened with an epidemic of typhus, and is believed to have been of sustained value in preventing a recurrence of that disease.

FIELD LAUNDRIES

The first field steam laundries used in the Austrian Army were imported from Germany, the German Army having been equipped with a large number of such laundries already in time of peace. The German field laundry, consisting of two automobiles and two tenders, proved however to be too extensive and too elaborate for the purposes of the Austrian Army. Smaller units, devised by Landsturm Engineer Geza Zoltan, consisting of two vehicles, viz.: one automobile and one trailer, were used in the Austrian service. The apparatus was constructed by the firm of K. Knuth, in Budapest. The cars employed were manufactured by the Austro-Daimler Company. On the platform of the tender, on a common iron base, were mounted a mangle and a centrifuge drying machine, which could handle in one day about 1,200 kg. of linen. The motor car carried the frame work of the drying chamber, the wings forming the side walls of the drying chamber, tent material, and a supply of soap.

The tender carried a movable engine of about 15 horsepower, a steam pump and a belt gearing shaft. The steam pump supplied steam to the water vessels, to the kettle boiling linen, and to the drying chamber. The piping system of the plant was stationary, but could be connected with the machines on the tender by means of special copper tubes. The tender was constructed in the shape of a box, its walls being of wood and double, with an insulating layer between them. They could be removed and used for the construction of the drying chamber. This

latter had a heating surface of about 72 square meters, and dried 100 kg. of linen an hour. The condensed water of the drying chamber was conveyed to the filling reservoir of the engines, and used for supplying the same. Vitiated air was removed by fans.

Assembling the Plant.—The tender was drawn by the motor car to some suitable place, the machines and apparatus carried on the tender were taken down by means of rollers and connected with the engine or with the steam pump respectively, the drying chamber was erected by use of the side walls of the tender and of the wings carried on the motor car. Finally the whole plant was covered by a tent, the material for which was carried on the motor car.

When the laundry was established the automobile was used for the transportation of linen. The loading of the whole plant preparatory to following the movement of the troops required from six to eight hours.

The personnel consisted of a Landsturm engineer officer, twenty-two Landsturm soldiers, among which were a trained chauffeur, a mechanician and an engineer.

This field laundry was a highly mobile and satisfactory unit, traveling on an average road at from 16 to 18 km. per hour. It was comparatively inexpensive, and later the apparatus also operated a shower bath system which gave facility for bathing to 1,000 men per day.

On June 8, 1915, I inspected, at Maramos Siget, a mobile steam laundry not provided with transport by auto trucks. This consisted of the following parts:

A boiler mounted on wheels, which furnished its own power for its own locomotion when the plant was moved, and when stationary furnished steam to heat water, operate a pump and other machinery.

A pump connected by rubber tubing with a convenient well or stream.

Two cylindrical mangles, about 6 inches by 4 inches.

Two centrifugal drying machines.

A drying chamber about 7 feet cube, made of heavy canvas.

A steel frame work to support tentage for covering the plant.

A tent for this purpose (rarely used).

A box tank, 6½ by 4½ by 2½ feet, supported by the framework.

Six olive green rectangular tents, 10 feet square, 7½ feet high.

Four sewing machines.

This laundry sometimes operated in conjunction with a bath train, especially if the latter was operating over short distances, but was often independent. When camp was moved the engine proceeded by road and the remainder of the equipment was shipped by rail. The unit operated as a rule near the railway, where laundry could be received

and redistributed most conveniently, near a road, and in the immediate vicinity of a water supply. It was sometimes associated with large groups of hospitals. Its capacity was about 6,000 pieces a day, but its usual output was 5,000 pieces.

Necessary repairs to the materials washed were made by three or four seamstresses hired locally.

The personnel consisted of one lieutenant and five men. They were attached for rations to the nearest unit.

This laundry proved of very great value. It was eventually dissociated from the bath train almost entirely, and served hospitals that were newly established near headquarters of the Seventh Army, and further to the front. It also served the troops in the trenches whose soiled clothing was collected at stated intervals and forwarded to it by wagon or by rail. The value of this unit was shown by the fact that its equipment was gradually enlarged, and that others, similar to it, were said to have been constructed.

A SIMPLE METHOD OF DETECTING SIMULATED DEAFNESS

Medical Boards not infrequently meet with men who state that they are "hard of hearing" in one or both ears, and in a number of these cases the examiner suspects malingering, or at least an exaggeration of their deafness. Dr. John J. Eyre has written to us describing a method of detecting simulation which he has found of practical service as a member of the Shoreditch Medical Board, and is not contained in the standard works on malingering. The usual tests, such as the watch and the tuning-fork, take time and are open to objection, as they depend upon the statement of the subject as to whether he can hear them or not. It occurred to him that the involuntary blinking of the eye might be used as a test applied in the following way. The recruit, who stated that he was very hard of hearing, was first asked which ear was the deafer, and then requested to close it with the index finger of the hand of the same side. Standing on the opposite side, with his face 6 to 8 inches away from the ear, and after pretending to examine the ear for a few seconds, Dr. Eyre then whispered suddenly, "Shut your eyes." Before the recruit could take thought he closed his eyes and revealed the fact that he was a malingerer. Dr. Eyre suggests that this method may also be employed as a rough-and-ready test for varying degrees of deafness, the voice being gradually raised or the mouth brought nearer to the ear of the subject until the eye reflex is obtained.—*The Lancet*, September 1, 1917.

A GUIDE TO FACILITATE THE ESTABLISHMENT AND ADMINISTRATION OF THE MEDICAL GROUP OF PORTS OF EMBARKATION IN TIME OF WAR OR OF THREATENED HOSTILITIES INVOLVING OVERSEA OPERATIONS

By Lieut. Colonel E. W. RICH
Medical Corps, United States Army

THIS paper is prepared with the object of preserving, and making available for use in the future, the information and experience acquired by those medical officers and enlisted men who were on duty with the Medical Group of the Port of Embarkation, at Galveston, Tex., during the period of its organization, March 18, 1913, to November 15, 1915.

As far as the writer has been able to learn, no attempt has ever been made heretofore in the United States Army to establish an organization of this nature, having a commander with a general staff, and an administrative and technical staff, independent of department and mobile troop commanders, and responsible directly to the War Department for the efficient and economical direction of operations It also seems to be a fact that, up to the time of the establishment of the Galveston Port of Embarkation in 1913, no regulations had been published governing the formation or administration of such an organization, but on May 21, 1913, General Orders No. 35, War Department, were issued defining the duties and authority of the commander and outlining by implication, in a very general manner, the duties of officers constituting the administrative and technical staff. These orders have since been embodied in Field Service Regulations and may be found on page 114, paragraph 257, of the 1914 edition. The commissioned personnel of a Port of Embarkation is enumerated on page 48 of "Tables of Organization," 1914.

By reference to paragraph 257 of the Field Service Regulations it will be seen that the duties of the commander of the Port of Embarkation are as follows:

(*a*) To arrange camps for the troops at or near the port of embarkation.

(*b*) To accumulate supplies for the maintenance of the expeditionary force while at the port of embarkation and until its arrival at the port of debarkation.

(*c*) To accumulate and ship the necessary supplies for the maintenance of the troops at the oversea base pending the organization of the supply services in the theater of operations.

(*d*) To make all detailed arrangements for the prompt detraining of troops and material and for their subsequent embarkation.

(*e*) To see that the ships furnished him by the Quartermaster Corps are properly fitted for use as transports.

(*f*) To operate and maintain the military shipping and traffic between his port and the oversea base through a superintendent of transport service, who is a member of his staff.

(*g*) To command all administrative groups assigned to the port of embarkation and to be directly responsible to the War Department for the efficient and economical direction of their operations.

The commander of the port of embarkation, his staff and personnel are not subject to the orders of the commander of the troops at the concentration camp nor the latter commander to the orders of the former.

The duties the performance of which obviously and naturally fall to the Medical Department in assisting the commander to comply with the requirements of the paragraph quoted, divide themselves among the following offices: Surgeon in Charge; Sanitary Inspector; Medical Supply Depot; Medical Superintendent of Transports; Attending Surgeon; Camp Surgeon, Concentration Camp. (Par. 610, M. M. D., 1916.)

If, because of delayed operations, the so-called "Port of Embarkation" practically comes to assume the character of a supply organization only, providing for the needs of a concentration camp located in its vicinity, as occurred at Galveston, the offices enumerated above, except that of camp surgeon, may be satisfactorily filled by one energetic medical officer, provided he be a good administrator, that he have a sufficient number of competent enlisted assistants, and that his services as attending surgeon be confined to the organization of the Port of Embarkation. Under these conditions, one and the same office force should be able to perform all duties properly required of it. However, if active operations beyond the sea are actually contemplated, and if the medical group is to be expected to perform its varied duties in an efficient and coördinated manner, the several offices referred to above, with at least a portion of their permanent personnel, should be established early, in order that experience may be gained in those matters which in times of peace officers and men rarely have opportunity to familiarize themselves with. The work devolving upon the medical department in receiving, camping, supplying, and forwarding many divisions of troops abroad, will be so varied and of such extent that the surgeon in charge will find himself compelled to delegate a portion of sanitary duties to commissioned subordinates.

I. OFFICE OF THE SURGEON IN CHARGE

1. *Personnel*—(*a*) *Surgeon in Charge.*—The officer in charge of the medical group is assigned to the office by orders from the War Department. He is responsible for the proper performance of his duties to the commander of the Port of Embarkation and through him directly to higher authority in the War Department. His assignment makes him independent of the authority of department and division commanders, the commanders of concentration camps and their department, division and camp surgeons.

Upon joining for duty the surgeon should be announced as "Surgeon in Charge," in general orders issued from the headquarters, Port of Embarkation. The table of organization, page 48, "Tables of Organization, 1914," should be changed and made to conform to the system of designations used in Table 5, Line of Communications, page 40, covering the different departments of the sanitary service of the Port. The table would then read somewhat as follows:

. . . . . .

Administrative and Technical Staff: Medical Group—Surgeon in charge; sanitary inspector; supply depot; medical superintendent of transports; attending surgeon hospital post of embarkation, convalescent camp, and contagious disease hospital; hospital trains; Red Cross.

The necessity for an official designation that will suggest the duties to be performed by the senior surgeon was abundantly shown in Galveston. The work of the Port of Embarkation established in that city was carried on for nearly three years before discontinuance was ordered in the fall of 1915. However, this considerable period of time proved not sufficiently long to enable the Army at large, or even certain organizations and departments which had dealings with it, to acquire adequate knowledge of what a Port of Embarkation was for—what its organization, duties and authority were. And what is more to the point, the Office of the Surgeon provided an enigma which many never were able to solve. The failure to understand its relation to other organizations and offices was the cause of considerable confusion, delay and incoördination. Not infrequently the action of higher authority on various matters pertaining to the Medical Department was confusing, inconclusive, impracticable of accomplishment, or inconsistent with the nature of the organization because of the lack of knowledge referred to.

It will doubtless always be found that the number of officers, enlisted men, civilian employes and their families attached to the Port of Embarkation and entitled to medical attendance is considerable. If a

concentration camp be established at a Port of Embarkation, then the amount of medical attention demanded will, under certain circumstances, be very largely increased and the surgeon in charge will find himself overwhelmed by calls on his services by persons unattached to the Port of Embarkation, which demands he will be unable to meet because of the press of his proper duties. Among lay officers, their families, as well as civilians, the idea is quite generally held that a medical officer is only a doctor and is available at any time for personal medical attendance upon anyone who may be attached to the Army, regardless of any circumstances whatever. Care and treatment of the sick and injured are considered by these individuals as the only important duties any medical officer should or could have to perform, and his services should be freely available. At the same time it is well known that we still have on the active list certain officers who consider that the assignment of "doctors" to administrative duty is simply preposterous, even ludicrous.

Because of the conditions stated above, the surgeon in charge will meet with embarrassments in more ways than one, and his legitimate work will be hampered and made impossible of satisfactory accomplishment. It is believed that a better general understanding of the duties of the Surgeon's office would be gained by all concerned if the change in the Table of Organization, suggested above, were made.

(*b*) *Personnel—Enlisted.*—After consultation with the commanding officer, Port of Embarkation, and with his consent, the Surgeon General should be informed by wire of the needs of the medical group, and assignment to duty of the following should be requested:

	Surgeon's office	*Medical depot*	*Office of Med. Supt. and attending surgeon*	*Total*
Sergeant 1st Class (Chief Clerk)	1	1	1	3
Sergeant (Clerk)	1	1	0	2
Private 1st Class or Private (Messenger)	1	4	1	6

An effort should be made to have detailed to the offices indicated only such sergeants first class as have had more experience in administrative and clerical work than is performed in the ordinary post hospital, and sergeants will be found useful only if they are satisfactory typists and have had experience in clerical work.

Upon the arrival of army transports in the local port, the sanitary personnel of these ships may be called upon for temporary aid until the regularly assigned officers and men report for duty at headquarters.

2. *Office Furniture, Fixtures, Stationery, etc.*—Required: 2 desks, office or field, No. 1; 2 chairs, office or arm; 4 chairs, common; 2 tables,

common or typewriter; 2 typewriters; 4 baskets, letter; 1 cabinet, metal, for blanks and documents; 3 baskets, waste paper; 3 blotters, hand; 3 cups, sponge; 3 erasers, steel; 3 inkstands; 2 shears, office; 2 pads, ink, for stamps; 3 penracks; 6 paper weights; 3 rulers; clocks, call bells, stamps rubber, as required; paper, envelopes, ink, pencils, blank forms, etc., as listed in paragraph 891, M. M. D., 1916.

This list is made up on the assumption that the office will be located in a modern building in the downtown district, and that it will be properly furnished with sanitary heating, lighting and lavatory fixtures and will have the services of a janitor. Under other conditions, the following may be required: basins, delf, office; brooms, hair, long handle; buckets, galvanized iron; cuspidors; dishes, soap, office; lamps, stand; lamps, hanging; lamps, bracket; lanterns; looking glasses; mats, door; mops; pan, dust; paper, toilet; pitcher, delf, office; safe, iron; soap, ivory; towels, hand or paper; water cooler.

These articles may be obtained from some one of the following sources:

The Quartermaster, Port of Embarkation (on memo. receipt). This source is to be preferred, as much time will be saved if these supplies are immediately procurable from the Quartermaster.

The Medical Department, on requisition by mail or telegraph, as conditions determine, direct to the Surgeon General.

Authority to purchase locally certain articles not on the supply table, such as rubber stamps, may be obtained from the Surgeon General.

Authority to hire typewriters locally, necessary for immediate work, may be obtained from the Surgeon General. However, telegraphic request should be made upon the Surgeon General for the issue and delivery by express from the nearest general medical supply depot, of five of these machines, two to be used in the office of the surgeon in charge, two in the medical supply depot, and one in the office of the medical superintendent of transports and the attending surgeon.

Until the arrival of necessary office fixtures, various of these articles may be borrowed from the hospitals of the U. S. Army transports, which presumably will have been reported to the commander, Port of Embarkation, by the time the surgeon's office is opened.

3. *Additional Commissioned Personnel.*—As soon as practicable after reporting for duty, the surgeon should form an estimate of the probable amount of work to be handled by his department, and after consultation with the commander, Port of Embarkation, he should telegraph the Surgeon General for as many of the following enumerated medical officers as he may seem to require: 1 major, Sanitary Inspector; 1 major, or captain, Medical Supply Officer; 1 captain, Medical Superintendent

of Transports; 1 captain, or lieutenant, Attending Surgeon. Additional medical officers may be detailed from the personnel assigned to the Port of Embarkation, from time to time, to assist these officers as the amount of work increases.

4. It would be well for the chief medical officer to acquaint himself with the local weather conditions that may be expected in different seasons throughout the year. This may be done in part by securing copies of meteorological reports and other data from the chief of the Weather Bureau district in which the Port of Embarkation is established. A study of these reports as to prevailing winds, their strength and direction, of temperatures and humidity, will be of assistance in determining the proper location and design of hospitals, camps, etc., with a view to year-round occupancy, and will aid the surgeon in formulating recommendations in these matters that will prove wise and practicable. As an illustration of the further necessity for such a study, it may be mentioned that in the early part of the period during which troops were concentrated in Galveston, the city authorities offered to the War Department the use of Pelican Island in Galveston Bay as a site for hospitals, camps and storehouses. This offer was not accepted, and fortunately so, for in the great hurricane of August 16–17, 1915, Pelican Island was swept clean of every structure by the wind and sea, and practically every foot of land was submerged. In another instance, report was made by officers of the Quartermaster Corps that a large bath-house built outside the sea wall at Galveston would be quite ideal as a convalescent hospital for men invalided home from Mexico. A study of the weather report and of the building showed that, whereas the structure would serve nicely in the summer season and in moderate weather, it could not be heated during the "northers" of winter and was really unsafe in high winds. In fact, during the hurricane above referred to, this bath-house, with all other structures similarly located, was completely demolished and carried away The considerable loss of life and the great destruction of government and private property which the Army sustained at that time was very largely due to failure to take into consideration, in the selection of camp sites, that the proposed areas in the course of years had frequently been inundated by the sea and a repetition of this calamity could be expected at any time during the hurricane season.

5. *Establishment of Hospitals in the Port of Embarkation.*—To enable the Surgeon General to act rapidly and intelligently, the surgeon in charge, as early as may be practicable, should familiarize himself with the territory which has been acquired for the use of the Army at the Port of Embarkation. After consultation with the commander,

suitable sites should be selected for the establishment of a cantonment hospital, which would be called "The Hospital, Port of Embarkation." (Par. 609, M. M. D., 1916.) This hospital would be prepared to receive the more seriously sick from organizations camped at the Port of Embarkation, from the troops passing through, from transports in harbor, and it would also care for the sick and injured who were returned to the Port of Embarkation from the bases beyond the sea. In the preparation of plans, provision should be made for the following: A hospital for general medical and surgical cases, an isolation hospital for contagious diseases, a convalescent hospital or camp, a quarantine camp, a hospital for prisoners of war, a casual camp for sanitary personnel.

Upon determining the site of the proposed cantonment hospital and the number of beds required, it would not be difficult to draw tentative plans to cover the probable needs. The publication, "Plans and Specifications for Base and Stationary Hospitals" (Surgeon General's Office, October 30, 1906), should be consulted. By its aid, the arrangement of wards and auxiliary buildings in the allotted space should be an easy matter. Upon completion of the tentative plans it would doubtless be found possible to have a survey of the available area made by the engineer troops, who would stake out the location of buildings and prepare the blue prints of the ground plan and structures.

At Galveston, in 1913, plans were drawn up and blue-prints prepared which contemplated the construction of a cantonment hospital designed after the approved pavilion style. There was a capacity of 546 beds, and accommodations were made for 22 medical officers, 46 female nurses, and 200 enlisted men of the Medical Department. The plan was so conceived that the bed capacity could readily be increased without alteration of the general arrangement. The scheme proposed to utilize the post hospital at Fort Crockett as the main administration building, and to retain therein for their proper uses the excellent and elaborate facilities already installed, such as were contained in the modern operating room with its pressure steam sterilizers, the X-ray room, and the eye and ear room. There were, in addition, many moderate sized rooms which could well be utilized as offices for the commanding officer, adjutant, chiefs of surgical and medical services, chief nurse, chief clerk and his assistants. Enough space would then remain for an etherizing and recovery room, a room for recent operative cases, and possibly one for minor surgery and an office for the dental surgeon. The wards, squad rooms, kitchen and mess room would, of course, have to be given over to other purposes than those for which these apartments were originally designed. To the westward, northward and eastward of

the administration building, sufficient room was found in the space clear of permanent structures, for the erection of wards of approximately 1,000 beds and all required auxiliary buildings. The structures referred to are as described by Havard in "Military Hygiene," 1914, of simple construction, and can be erected by ordinary builders with material that can be purchased in any market. In the interest of simplicity a single type has been adopted for all purposes and the various buildings differ only in their interior arrangement. They are all one-story substantial frame structures, with walls and ceilings finished with tongued and grooved, beaded boards, heated by stoves and roofed with corrugated iron.

Each ward consists of a building 120 feet long and 26 feet wide, with ceiling 12 feet high, lighted by ten windows on each side. It is connected by a passage 10 feet long, with an annex in which are the lavatory on one side and the water heater on the other. In the end nearest the annex is a room on either side, one for special diet and the other for office and linen room. The ward proper is 106 feet, 8 inches long and accommodates 26 beds. It is heated by five jacketed stoves with bent pipes running up into ventilation shafts. The ventilation is effected by means of galvanized pipes conducting fresh air under the floor of the stoves, and of five ventilation shafts which receive the smoke pipes and are topped with "Star" ventilators.

The general arrangement of the buildings may vary greatly. Suggestions for a convenient and practical grouping will be found in the publication, "Plans and Specifications," already referred to.

The *Isolation Hospital* for contagious diseases should be included in the plans described above for the cantonment hospital. The more remote or detached pavilions may be assigned for the care of contagious cases.

Convalescent Hospital.—Provision will have to be made for the reception and care of a certain number of permanently or temporarily disabled officers and soldiers, until such time as they may be sufficiently recovered to be returned to the front, transferred, retired or discharged. The size and location of this hospital will have to be determined by a number of factors, including the magnitude of operations being conducted abroad and various local conditions.

Quarantine camp and casual camp for sanitary personnel may be located adjacent to the general hospital. Climatic conditions will determine largely whether tents, pavilions or other structures should be used to shelter troops while restricted under observation or awaiting assignment or transportation.

6. *Local Civil Hospitals.*—It is possible that in the early days of

troop concentration, adequate facilities for the care of the Army sick and injured may be lacking, and thereafter when the campaign abroad has become well developed it is reasonable to fear that such a return of disabled troops might occur that the local military hospitals would find themselves swamped under the influx. Furthermore, the civil institutions might be of assistance at times because of their laboratories, operating facilities, and X-ray equipment, and their accommodations for women and children will be of importance to the families of officers, men and civilian employees on duty in the city.

For the reasons set forth above, the surgeon in charge should acquaint himself with the number, and location of all public and private hospitals in the city and vicinity, their size, accommodations and equipment, as well as the possibility of expansion by use of temporary structures or tentage on adjacent grounds and vacant lots. Coöperation among the hospital staff and boards of managers, the army authorities and the Red Cross representatives doubtless could make available for army purposes valuable auxiliaries to the cantonment hospital described.

7. The major part of the duties of the surgeon in charge will be more in the nature of routine. They will be practically those of Department Surgeons and Surgeons in Charge of Lines of Communications, in so far as regulations for these offices can be made to apply in the Port of Embarkation. (See pars. 364, 365, 368, 369, 817, 818, 819, M. M. D., 1916.)

The regulations which will be found to apply in this organization may be summarized as follows:

(*a*) The surgeon in charge will be the consultant and adviser of the commander on all subjects pertaining to the Medical Department of the Port of Embarkation.

(*b*) He will establish and conduct a system of records and correspondence which will take care of all matters pertaining to the Medical Department which come to the headquarters of the Port of Embarkation for action or other disposition. Practically all retained reports, records, and copies of correspondence pertaining to medical and sanitary matters which require the action of the commander will be filed here. Letters pertaining to this department and originating at these headquarters, as well as indorsements for letters, reports and papers received of a medical nature, will be written by the surgeon after learning the wishes of the commander, if necessary. Letters or indorsements will be prepared for the signature of the commander, the adjutant or the surgeon as may be proper in different cases.

(*c*) In so far as he has authority, the surgeon will take final action

on all letters, papers, reports, and returns referred to, or received by him.

(*d*) He should list the reports and returns periodically required from medical officers under his supervision, should check them off as they are received, and subject them to a critical examination. He should direct correction of them when necessary, and if they call for no special action at his hand, he should, after taking from them such memoranda as he may need for the purposes of his office, transmit them to higher authority (when required) without formal indorsement, but they should receive his office stamp. Duplicate copies of some of these reports should be required for file.

Periodic reports.—Personal reports of medical officers (dental and contract surgeons, in duplicate); reports of Sick and Wounded (duplicate report sheet); returns of Medical Department (duplicate); hospital fund statements; laundry vouchers; efficiency reports of nurses; monthly reports from sanitary inspector (Form 50, in duplicate); returns of Nurse Corps (in duplicate); reports of dental work; daily field reports of sanitary personnel and transportation (Form 82); daily field reports of patients (Form 83).

Occasional Reports.—Report of change of station or status, medical officers, dental surgeons, contract surgeons, medical department, or army nurse corps.

Report of death of medical officer, dental surgeon, contract surgeon, master hospital sergeant, hospital sergeant, sergeant first class, Medical Department.

Report of appearance of epidemic disease in an organization at Port of Embarkation.

Report of appearance of epidemic disease in a command en route to Port of Embarkation.

Special reports of interesting cases.

(*e*) The surgeon will report on the efficiency of each medical officer, dental surgeon and contract surgeon serving in or attached to the Port of Embarkation.

(*f*) Under special instructions from the Surgeon General, he will authorize enlistments in the Medical Department, and recommend transfers to the Medical Department from the line.

(*g*) Under special instructions from the Surgeon General, he will supervise the examination of corporals, privates first class, and privates of the Medical Department for appointment as sergeant therein.

(*h*) He will promote members of the Medical Department to the grade of private first class, lance corporal, and corporal therein, and will make ratings as dispensary assistant, nurse, and surgical assistant. He should have authority to reduce noncommissioned officers, cooks, and

privates, first class, as provided for department and division surgeons (par. 1407, A. R., as amended by changes No. 49).

(*i*) He will recommend to the Commander, Port of Embarkation, the transfer of members of the Medical Department from organization to organization within the Port of Embarkation, including the detachments on transports.

(*j*) He will supervise the instruction of the enlisted personnel, Medical Department.

(*k*) He will prepare, or cause to be prepared, plans and estimates for such temporary or semipermanent structures as may be required by the Medical Department at the Port of Embarkation, and will forward them to higher authority through military channels for necessary action.

(*l*) He will recommend appropriate action on estimates for the repair of hospitals, and other buildings of the Medical Department.

(*m*) He will examine requisitions for medical and hospital supplies, including those from the Medical Depot, Port of Embarkation, and will take appropriate action thereon. Transport requisitions will be acted on by the Medical Superintendent.

(*n*) He will give authority under Army Regulations for the presentation of unserviceable medical property to an inspector for condemnation.

(*o*) He will recommend appropriate disposition of condemned medical property on inventory and inspection reports referred to him for remark.

(*p*) He will be responsible for the proper supply of the sanitary organizations and troops at the Port of Embarkation, and will see that timely action is taken by the Medical Supply Officer to replenish supplies before they are exhausted or unduly depleted.

(*q*) He will act on accounts for supplies purchased for, or services rendered to, the Medical Department.

(*r*) He will act on accounts of civilians for the medical care and treatment of persons entitled thereto at the expense of the United States.

(*s*) He will examine and audit the statements of the hospital fund, should verify the vouchers therewith and ascertain the propriety of the expenditures vouched for (transports excepted).

(*t*) He will ascertain whether vaccinations against smallpox and typhoid fever of all the personnel of the Port of Embarkation (including civilian employes) have been made, and will complete such vaccinations as may be necessary.

(*u*) He will see that proper inspections are made of sanitary conditions in the Port of Embarkation and of the medical organizations and transports attached. These inspections will ordinarily be made

by the sanitary inspector, except that inspections of transports will be made by the Medical Superintendent.

(*v*) In the absence of an attending surgeon assigned by the War Department, he will provide for medical attendance for the Port of Embarkation.

(*w*) He will supervise the Medical Superintendent of Transports in his duties.

(*x*) He will direct and control the personnel of the American National Red Cross on duty with the Port of Embarkation.

(*y*) He will decide whether personal services individually volunteered shall be accepted (par. 537, M. M. D.), and, when accepted, he will direct how it shall be employed.

(*z*) He will take the necessary steps to secure publication to the entire command of orders containing specific instructions regarding hygiene, including venereal prophylaxis (G. O. 71, W. D., 1913) and camp sanitation.

(*aa*) He will arrange with the surgeon, Base Group, Line of Communications, regarding information from time to time as to number and character of cases to be received from the Theater of Operations.

(*bb*) With the approval of the Surgeon General, he may give authority for the purchase in local markets of medical supplies immediately necessary for the care of the sick and wounded and the prevention or spread of disease.

(*cc*) With the approval of the Surgeon General he may receive voluntary contributions in money or kind for the bebefit of the sick and wounded, and he may expend the same as he deems fit.

(*dd*) With the approval of the Surgeon General, he may make contracts with surgeons and employ or authorize the employment of other civilians for emergency service under the Medical Department of the Port of Embarkation.

(*ee*) He will recommend appropriate action upon applications for sick leave, sick furlough, and for furlough of members of the Medical Department of the Port of Embarkation.

(*ff*) He will communicate with the Surgeon General regarding medical arrangements for the movement of patients from the Port of Embarkation to other hospitals or camps by ship, railroad, or otherwise, and for the transfer of Medical Department personnel and supplies to the base of operations.

(*gg*) Under instructions from the Surgeon General, he will supervise the operation of hospital trains and boats having their termini at the Port of Embarkation.

(*hh*) He will keep a directory of the commissioned personnel under his supervision (Form 70).

II. SANITARY INSPECTOR

The Sanitary Inspector will be designated by the Surgeon General and assigned by order of the War Department. He will serve as assistant to the surgeon in charge and may occupy a desk in his office.

The further duties of this office are analogous to those of department sanitary inspector. He will be governed by the regulations prescribed for the latter (pars. 371 to 374, M. M. D., 1916) in so far as they are applicable to the changed conditions (par. 626, M. M. D., 1916).

III. MEDICAL SUPPLY DEPOT

1. *Personnel.*—1 major, junior rank, or captain, Officer in Charge; 1 sergeant, first class (or higher grade if available), chief clerk, chief packer and in general charge; 1 sergeant, in immediate charge of stock, assistant clerk and assistant packer; 4 privates first class, or privates (one as storekeeper and assistant packer, one as artificer, one as messenger and laborer, one as laborer for loading and unloading of teams, stacking and sorting of supplies, and other miscellaneous work).

The force enumerated above will be found none too large for the work which will have to be done. In all probability the personnel assigned, without exception, will be inexperienced in their duties, and most of the enlisted men will be found to be quite unfamiliar with the articles they will have to handle. Moreover, the care of the stock itself, the attention that will have to be given it to preserve it from damage wrought by rats and mice, roaches and other insects, rust, dampness, mildew and mould, dust and dirt, water from leaky roofs and windows, and from other destructive agencies—this work alone will require more labor than will at first be suspected. A suitable building for use by the depot may be difficult to find under emergency conditions, and it may be necessary to have to put up with a structure in poor repair, poorly located, and not well suited to the needs. For the reasons stated above, it is deemed best for the interests of the service to have sufficient enlisted men in training at the depot from the beginning of mobilization, in order that the work may be carried on smoothly and efficiently, even in spite of greatly increased demands which may be made upon it.

2. *Office and Storeroom Equipment.*—Required: (*a*) for office same as enumerated for office of Surgeon in charge, *q. v.* In addition, 6 files Shannon, small, and 1 numbering machine. (*b*) for storeroom: 1 chest, tool, No. 1; 1 scales and weights, platform; 2 pots, marking; 2 brushes, marking; 1 water cooler; 6 brooms, corn; 6 buckets, g. i.; 6 lanterns with wicks and white globes; 1 refrigerator (for biological products); 1 flag, Red Cross; 1 flag, national; 2 flag halyards; fire

extinguishers; paper, wrapping, brown; twine, fine and coarse; lamp black; 2 dust pans; 2 brooms, hair, long handle, for floor; 2 brushes, hair, counter; stencils, card board, as required; 2 stencil brushes; stencil paste; 2 two-wheeled trucks; 2 box scrapers; 1 packing table, 10 feet by 4 feet; excelsior; box material; 2 boards, clip, cap.

Many of the articles enumerated may be obtained from the Quartermaster on memorandum receipt. Others may be taken from the stock for use in the depot, the expendable supplies being dropped on Form 18, M. D., as "expended in depot." Such articles as rubber stamps, excelsior and box material may be purchased locally on the authority of the Surgeon General. Requisition will have to be made for the remaining articles.

3. *Stock Supplies.*—The first supplies sent to the Galveston depot consisted of one "Reserve Medical Supply," less articles furnished by the Quartermaster Corps and the Ordnance Department (pars. 847 to 854, M. M. D., 1911). As this stock was designed to provide for the needs of one division for a month, and as the sanitary detachments of the various organizations brought to the concentration camp a sufficient supply for immediate use, the depot found itself able to fill all requisitions received without embarrassment, until such time as additional supplies could be obtained from the general depot at St. Louis. Subsequently, requisitions were made up as probable needs indicated. After approval by the Surgeon General, they were forwarded to the depot in Washington, New York, or St. Louis for issue.

It is presumed that, to be consistent with latest regulations, the supply officer should include in his first requisition, at least one medical reserve unit (par. 891) for each division to be provided for, and thereafter he would replenish his supplies in the manner prescribed in paragraph 782, M. M. D., 1916, if so directed by the Surgeon General.

The "Reserve Medical Supply" was dropped as such, the component articles being taken up individually on the return of medical property, Form 17. Gradually as time lengthened and the needs of the organizations became apparent, the variety of articles carried in stock was enlarged until the depot was in a position to furnish complete cases, chests, and pouches; and any article belonging therein, as well as extra parts for field equipment, could be replaced immediately.

Biological products (vaccines and antitoxins) should be kept on hand in considerable quantities. The list should include typhoid, paratyphoid, and smallpox vaccines, diphtheria and tetanus antitoxins, and serum antimeningitidis. The first two mentioned will be supplied by the Army Medical School on requisition to the Surgeon General. The demand for staphylococcus, staphylococcus-acne, streptococcus,

and gonococcus vaccine, also prepared by the school, probably will not be great. They should be obtained as required.

The other products mentioned will be purchased from manufacturers designated by the Surgeon General at reduced prices agreed upon by both parties. All vaccines, etc., will be preserved by refrigeration in ice boxes which may be furnished by the Quartermaster. Ice may also be obtained from the same source. Upon the expiration of the time limit stamped on each package, steps should be taken to exchange the old stock, unless by agreement with the manufacturers no replacement is expected.

Before long it was learned that to be able to furnish all articles asked for without delay, supplies sufficient for six months must be kept on hand, and this was done. This seemingly large stock was necessary because of the erratic manner in which articles were demanded, the occasional loss of supplies in transit to the depot, and the inability of the general depots, at times, to furnish certain articles promptly.

At the time of the establishment of the depot, the probable period of its duration was very much in question and the extent of its future growth was problematical. Consequently no haste was made to install shelving. It was found that for several months, adequate space could be provided by utilizing the standard packing boxes (mentioned in par. 863, M. M. D., 1916, and described in par. 860, of the 1911 manual) in which the medical supplies had been received. By standing boxes on end at suitable intervals, with their covers open at an angle of 90 degrees and placing other boxes on top of the standing cases with covers also open at 90 degrees, three rows of shelves will be improvised if the floor be used for the larger and heavier articles. The lids of the standing boxes opened to the front serve to support the covers of the upper cases and a few nails here and there will make the arrangement quite secure. Articles are placed on this shelving in the order in which they are listed in the manual medical department, paragraph 891.

Post supplies and additional articles are arranged alphabetically after the field supplies.

A heavy packing table 10 feet by 4 feet should be located in the center of the issue room, and two large boxes for packing material, one for excelsior and the other for paper, cardboard, etc., should be placed conveniently near the table.

4. *Filling Requisitions.*—Upon the receipt of approved requisitions, they should be carefully scrutinized in the office for errors in nomenclature, size or count of articles required, etc. A misunderstanding between the office and the issue room will permit of discrepancies between articles furnished and those invoiced.

Issues may be made very expeditiously and with almost perfect accuracy in the following manner:

The chief packer reads off the items in the order in which they appear on the requisition, checking or making notations as he does so. The sergeant, assistant packer, removes the articles called for from the shelves, at the same time repeating aloud the name and number of the article for verification. The storekeeper follows along with a good-sized tray, receiving the supplies from the sergeant and taking note of the correctness of the issue. It has been found that the tray contained in Box No. 1, standard packing case (par. 860, M. M. D., 1911) is quite suitable for this purpose. The loaded trays are placed upon the packing table and their contents thence are stowed into shipping boxes, names of articles and quantities being called off as they go in. Secondary check is made upon the requisition. The completed box is then turned over to the artificer, who closes it, marks it, and gives it a number. The Quartermaster may require that all packages be weighed as well, and if supplies are to go via transport, cubic contents will also have to be determined. Boxes ready for shipment may be turned over to the quartermaster for delivery, driver's signature being taken in a shipping receipt book, or formal invoices and receipts may have to be prepared.

Packer's lists have not been found necessary where the organization supplied was not larger than a regiment.

5. The space allotted for the depot was as follows: Issue and packing room 21 feet by 39 feet; storeroom for original packages, 20 feet by 77 feet.

This floor area proved ample in providing for one division of troops and thirteen transports.

6. All boxes received containing miscellaneous articles should be unpacked and placed on the shelves. As far as is practicable, individual articles and packages should be stamped with date of receipt and should then be arranged on the shelves in such manner that those longest on hand will be the first issued. None but original packages (and those containing but one item) should be stored intact. These should be sorted and arranged about as listed in the Medical Manual, in order to facilitate handling and the taking of inventory. Account of stock should be taken monthly and at the quarterly inventory, all original boxes remaining in stock should be carefully checked by use of colored labels bearing date of inventory. Different colored labels should be used at each quarterly inventory. This enables one at a glance to locate boxes that are not checked and is of great value in keeping stock on hand fresh.

7. By requesting the return of emptied packing cases from organizations, much economy can be practiced in the use of boxes, excelsior, etc.

8. The records and correspondence of the depot were kept in conformity with paragraphs 380 and 402, M. M. D., except such as pertained to a disbursing officer. No disbursing officer was appointed for the Medical Department at the Port of Embarkation, nor was there any need for one, as local purchases were very small. Vaccines, and such supplies only, were purchased in considerable quantities. Vouchers in payment were forwarded to the Surgeon General for approval, after which they were sent to the proper disbursing officer for settlement.

9. In addition to the records required by the Manual for the Medical Department, a book of requisitions was kept for the convenience of the office force. All requisitions received or submitted were numbered and entered therein. The following data also appeared: date of requisition and date of receipt in the office; from what organization received and its station or location; nature of supplies, whether vaccines, blank forms, post or field supplies; date of issue and the voucher number.

IV. MEDICAL SUPERINTENDENT OF TRANSPORTS

1. Paragraph 610, M. M. D., 1916, states that the Surgeon, Port of Embarkation, is charged with the medical superintendence of the transport service. In case it is found impracticable, because of the press of other duties, for him to assume this work, request should be made of the War Department by the commander for assignment of another officer to this position as per paragraph 5, Army Transport Service Regulations. The attending surgeon may fill this office in addition to his own.

Transport regulations state in paragraph 2 (*b*):

> Under war conditions, *i. e.*, where ports of embarkation . . . have been established, the Transport Service will be under the supervision of the commander of the port of embarkation, etc.

One quartermaster will be assigned as superintendent (Table of Organizations, p. 48).

Under war conditions, the medical superintendent should be made responsible to the commander and the surgeon in charge and not to the general superintendent as in times of peace. It was found in the Galveston experience that only in this way could coöperation and coördination between the Quartermaster Corps and the Medical Department be secured.

2. Enlisted Personnel: 1 sergeant first class, or sergeant; 1 private first class, or private.

3. Office equipment: may be selected by referring to corresponding paragraphs under "Surgeon in Charge."

4. The general duties of the Medical Superintendent are laid down in paragraph 10 of the transport regulations, and in the section "Medical Department" beginning on page 35. In addition, it will be necessary to look after the following matters:

Careful inspection of all transports should be made immediately upon their first arrival, to see that each is provided with at least three months medical supplies, figured on the total carrying capacity, passengers and crew (par. 842 *et seq.*, M. M. D.). A reasonable amount of biological products should be on hand, including enough smallpox vaccine to re-inoculate all persons aboard in case of need.

A personnel of one medical officer and at least one sergeant and two privates first class, or privates, Medical Department, should be assigned to troopships. Animal transports ordinarily will require one sergeant equipped with a medical and surgical chest and such additional supplies as may be found necessary.

In the case of transports without surgeons, steps must be taken to secure the vaccination of all members of the crews including ships' officers, who are not already protected Immunization against smallpox, typhoid and paratyphoid must be insured. Record will be made on Form 81.

The Medical Superintendent will see that facilities are provided on each transport so that enlisted men and civilian employees may apply the venereal prophylaxis provided by the Surgeon General. He will issue instructions to transport surgeons relative to the periodic inspection of rat-guards.

After consultation with the commander, he should arrange a system whereby one medical officer will always be available as medical officer of the day when several transports are lying at the same or adjacent piers.

He will comply with paragraph 424, M. M. D., 1916.

Authorization as follows was given the Medical Superintendent at San Francisco, Cal., by the Surgeon General (1st Ind. to letter, Surgeon General's Office, January 25, 1912, 82775-D):

He will approve requisitions for medical supplies, and forward to the Department Surgeon (surgeon in charge, Port of Embarkation) who upon approval will send them to the supply depot for issue.

He will give authority for repairs to medical property and forward to the Department Surgeon (surgeon in charge, Post of Embarkation), who is authorized to have property sent to a medical supply depot when approved by him.

He will act on the hospital fund statements, the returns of medical department, and the reports of sick and wounded, and forward direct to the Surgeon General. (It is believed that in the Port of Embarkation, these reports, etc., should be forwarded through the office of the surgeon in charge.)

V. ATTENDING SURGEON

1. *Personnel.*—See Section IV, Medical Superintendent of Transports.

2. *Duties.*—(*a*) To attend the sick and injured of the Port of Embarkation, officers and enlisted men stationed locally without other medical attendance, and families living in the city who are entitled to treatment.

(*b*) Recruiting officer of the Port of Embarkation.

VI. CAMP SURGEON

See paragraph 599, M. M. D., 1916.

"WHEN TWO STRONG MEN STAND FACE TO FACE"

"However great a part material resources and munitions have played and are playing in this war, one fact must not be overlooked, and that is the fighting man. He is just as important and necessary as ever, and the demands that will be made upon his nerves and endurance will be greater than ever before. We need and must have men, millions of them, and they must be trained thoroughly; trained to face the grueling requirements of modern warfare. How can we get them? Only through the American people, who are their own masters.

"Unless this great nation of free men wakes up and safeguards its priceless heritage of liberty and free institutions, it must sooner or later pay the penalty of its self-assurance which still confides in the million men who will spring from the earth between sunrise and sunset, each armed with a squirrel rifle and a Ford automobile. There is but one solution for the problem—universal military training. But the solution rests in the hands of the American people."—*Major General Kuhn, U. S. Army.*

AUTOMOBILE TRANSPORT OF THE WOUNDED

By a Military Observer

INTRODUCTION

I AM forwarding with this a report written by Mr. Stephen Thorn, an American who drove an ambulance and was afterward Chief of Section in the Harges Volunteer Ambulance Corps. Mr. Thorn had ample opportunity to judge of the working of a service of this class from the standpoint of both front line work and that of the service farther to the rear, and his report must be taken as the opinion of a practical and experienced specialist who knows very exactly what he is writing about. He was awarded the "Croix de Guerre" for duty under fire. I think the various phases of the work which he describes are of much interest and that they are of value in determining the organization of such a service in our own Army. The fact that the work was accomplished by a volunteer force in no way affects its value. In the first place, the character of service rendered was identical with that of the regular sections, and in the second, the French have, with the assent of the American Red Cross, modeled these sections on the same line as those in operation in the French Army. Reference to my report of February 8, 1916, will show the organization and personnel in detail. Mr. Thorn and I are in accord with regard to one point: that is, that the enlistment for six months is not long enough. At the end of that time a man is trained and efficient, and, as he is replaced by one who is not, there is a constant rotation of green men who have to be broken in to the work.

There is no question as to the importance of the automobile in the transport of the wounded. It has been very plainly demonstrated during this war and each succeeding month has more clearly shown that this means of transport is an essential. In 1914 the French were practically unprovided with automobiles for this duty; as a matter of fact, the entire sanitary service was in a state of evolution since the changes—the reorganization—contemplated by the law of 1910 had been only partially put in operation. There were a few sections in operation, but the number was so inconsiderable that they were a negligible factor in evacuation work.

This question was taken up seriously by the Superior Advisory Board on Sanitary Matters, the so-called "Reinach Commission," and the rapid completion of this service was urgently recommended. Among other things, the report says:

The figure of 60 sanitary automobiles per army corps instead of 25 to 30 has not been fixed at hazard by the Committee. It corresponds to the average number of badly wounded transported by a sanitary train. It should permit the loading and departure of several of these trains at close intervals. It should not, in our opinion, be reduced.

There is a non-utilization of material force as of moral force. It would be an error, of which the consequences might prove serious, not to utilize to the maximum, mechanical traction for the transportation of the wounded.

This is no uncertain opinion as to the value of this from of transport, and, expressed as it is by this commission, must carry weight.

There was much diversity in type of cars at the beginning. This was natural, as it was necessary to utilize any kind of motor transport available. Experience and experiment gradually showed what was best adapted for various services, and the service gradually standardized.

There is still some discussion in regard to the relative advantages of the light and heavy types of car. It is probable that each has its own field of usefulness and that outside of this field each shows to disadvantage. I shall not go into detail since Mr. Thorn discusses this in his report. It is sufficient to say that the French have come to the conclusion that the "type Kellner," which carries five lying cases, is the one best adapted to their general use.

It is, I think, generally conceded that the sections should be made up of *one type* of car, whatever that may be. This would seem to be obvious. To carry spare parts and repair material for four or five different makes would unnecessarily complicate matters.

The French do not at present insist on any particular type of chassis or engine. That would be hardly practicable for a country that is using as much motor transport as France is at present. They have adopted, however, as a standard, an engine of about 15 horsepower. The body of the car is standardized and the five-case type, that is to say, one which carries five lying cases, is the one adopted. It was found that it was perfectly practical to add the extra case, and of course this increased capacity is a very real advantage when multiplied by the cars of a section and again by the number of trips run. The body is described by Mr. Thorn. As I intimated at the beginning of this paragraph, the sections, as made up, consist of one make of car; this has come to be recognized as essential for reasons of smooth running and economy.

This service is not entirely and undividedly under the sanitary service. With the tremendous expansion of automobile traction it was found advisable to separate this service and it is now a distinct bureau. For a time it was a sub-bureau of the artillery, but I am

informed that now it is under independent management. All matters of a technical nature are directed by this bureau; it is charged with the furnishing of cars of whatever type, of repair work, furnishing of supplies, etc. As there is a branch of this "Service d'Automobiles" with every army, the functioning of the transport system is in this way simplified. As a matter of fact, this phase of the transportation of the wounded is not a purely medical question. It involves the question of transportation, and once a man is loaded in a motor ambulance there is not much to be done for him until he has reached his destination. I recognize, of course, that there may be occasional exceptions to this rule; sudden hemorrhage, for instance, but I am speaking in integral figures rather than in fractions, and the question in the main is that of moving material in need of repair from one point to another with the least practical delay and the greatest comfort to the wounded. That is certainly a transportation problem. Be that as it may, the grouping of all motor-driven transportation under one head and direction seems to be a rational move and one in the line of sensible specialism.

The *technical direction*, from a medical standpoint, of the different sections is governed by the responsible Medical Officer of the corps, division or unit concerned. It is his duty to see that the functioning of the section is smooth, that the wounded are evacuated with the least practicable delay, and to provide for the interlocking of the transport system with the different hospitals so that delivery will be as promptly and efficiently carried out as the collection: to insure that delay at the rear end of the run shall not embarrass the work of the advanced portion. This is, under present conditions, a less difficult problem than if the French were engaged in a war of movement. The establishment of fixed collecting points, the use of the telephone, the knowledge of road conditions and the intensity of the fire at various points make it simpler than if it were carried on under constantly changing conditions with varying runs and different delivery points. I have heard occasional complaint that the delivery of the wounded was not always as prompt as might have been expected due to faulty orders, or lack of coördination with the various regional hospitals. Mr. Thorn refers to this once or twice in his report, but I am convinced that in the very large majority of cases the evacuation of the wounded is carried out promptly and in a very workmanlike manner.

It is well to bear in mind, in considering the functioning of the units as set forth in Mr. Thorn's report, that conditions here are of a special nature—that the service is that provided for a fixed front. What modifications would have to be made in the event of a campaign of movement are, of course, problematic. Another striking difference between conditions in France and those in our own country is that of the roads.

NOTES, EXPERIENCES AND SUGGESTIONS ON THE AUTOMOBILE AMBULANCE SERVICE OF A MODERN ARMY IN THE FIELD[1]

By STEPHEN THORN, C. G.

Ex Chef de Section Sanitaire Americaine No. 5 (Harjes)

(With seven illustrations)

THE outbreak of the present European War in August, 1914, found the Ambulance Service of the French Army in the most antiquated condition, depending, as it did almost entirely, on horse-drawn vehicles of the type developed during the Franco-Prussian War, and including only two sections of automobile ambulances of twenty cars each.

It at once became evident that the automobile ambulance was the only solution for the handling of the sick and wounded under the conditions of a modern war, and though section after section of these cars were added to the French Army as rapidly as possible, a very long time elapsed before the service was anywhere near its proper strength, namely, one section of twenty ambulances for each division of infantry.

Under these circumstances, a great deal of assistance was, in the early part of the war, rendered by volunteers using their touring cars or cars with hastily constructed ambulance bodies.

These ambulance bodies very rapidly developed into two distinct types, the first of which, for the sake of convenience, will be called the American Ambulance type, the second the French Army type Kellner.

The American Ambulance type, built entirely on Ford chassis, was at first a four-stretcher ambulance, but as experience showed this to be too heavy for the light Fords, they were almost at once changed into three-stretcher cars. The first of this type appeared about the time of the battle of the Marne and, with the exception of altering them from four to three stretcher cars, the type has remained practically the same to the present day.

It was found that two alterations were necessary to the Ford chassis in order to make them suitable for ambulance service. Firstly, larger tires of equal size on all four wheels, 765 by 105 being the size recommended. Secondly, one extra leaf in the rear spring.

The construction of the body itself is represented in Figs. 1, 1*a*, and 1*b*.

The construction is sufficiently clearly indicated to require little description. Note, however, should be taken that the stretchers are not hung but rest on their legs, either on the floor of the car or, in the

[1]Based on nineteen months' experience at the front with the French Army.

case of the upper stretcher, in slides, and that the cross piece which supports these slides is removed and the slides themselves fold up against the sides of the car when the ambulance is to be used for patients capable of sitting up, four of whom can be carried and who are seated, as illustrated in Fig. 1*b*, on two boards placed across the car as near the driver as possible. These boards when not in use are placed on the floor of the car.

The stretchers, when in use, and which are longer than the body, project through holes cut in the tail board, these holes being covered with a canvas pocket. No provision is made for carrying the stretchers when folded and not in use, with the result that the man in charge of the ambulance usually carries them with one end resting on the floor, the other sticking out over the top of the tail board, much to the discomfort of the sitting patients, if there happen to be any.

The chief advantage of a Ford for ambulance work at the front is its lightness and great clearance, and this type of car will pull through mud, fields, etc., which would leave a larger car hopelessly bogged. On the other hand, the experience of the writer, who had six of these cars in the section under his command, would seem to show that the chassis is not sufficiently well built, and rarely a day would pass that one of these six were not out of commission with some such complaint as a bent front axle or bent tortion rods, or leaky radiator, or occasionally, the rear axle would snap off between the wheel and the end bearing in the axle housing.

It must, however, be said that the American Ambulance with nine full twenty-car sections of Fords in the field, have been most successful, though this is probably due to the excellent repair shop they have established in Kellners at ———, and also to the fact that little attention is paid to the wastage in cars.

Another great disadvantage of this type of ambulance is the enormous overhang of the body at the rear, and the difficulty of keeping the seated patients when carried, in the end of the car near the driver, as, unless watched all of the time, they move to the rear in order to be able to look out. A glance at Fig. 1 will show the enormous strain put on the rear axle by having the weight so far back. An idea of how great this strain is can be gathered from the fact that several of the heavy wood supporting sills snapped off at the point indicated by *A* in Fig. 1, which is where the actual chassis of the Ford ends.

The French Army type Kellner ambulance was much slower in developing to its present form and went through three distinct stages. The first of these may be called the angle iron canvas stage.

The construction of these bodies was most crude and gave little

protection to the wounded being transported, who were smothered with dust in summer, and almost frozen in winter. This type, however, had one advantage, and one only, and that was that six-stretcher cases could be carried, three on each side of the ambulance, one above the other.

The body itself was constructed of six upright U-shaped angle irons, with cross members at the top and bottom, those at the top being slightly sloped in order to give the necessary pitch for the roof. To these uprights twelve L-shaped angle irons were rivetted with the flat side up, to form the rails for the rollers to which the stretcher hangers were attached. These stretcher hangers of leather also contained a strong spring, the idea being that this would help absorb the road shocks. The roof was covered with waterproof material, the front and sides being of canvas, the rear having canvas curtains to allow the ambulance to be loaded.

The manner of loading was unique, and required at least four men, the driver being inside of the car to assist. The loading would start at the top stretcher on one side, and continue until that side was completed, when the charging of the other side would be undertaken. This latter was considerably more difficult, as, after the top stretcher was in place, there was no longer room inside the car for the driver, so that the last two stretchers would have to be put in without any assistance from the interior of the car. The wounded man's head was always towards the front of the ambulance.

The actual details of the loading were as follows. All of the rollers to which the stretcher hangers were attached were pushed to the rear of their respective rails. The top stretcher was then lifted to arms length by three men, two at the head and one at the feet. The driver inside of the car would then slip the loops of the stretcher hangers over the front handles of the stretcher, being careful to see that they were on as far as possible. The stretcher would then be pushed by the man at the feet and slide into place. The rear handles were fastened by chains ending in a hook attachment.

The unloading was accomplished in the reverse order, starting with the bottom stretcher, and was a much more ticklish operation, as the rollers would frequently jam on their respective rails, in which case the pull on the foot end of the stretcher would have a tendency to dislodge the front handles from the loops of the stretcher hangers, and it was only by the exercising of the greatest care that the stretcher with its wounded would be prevented from falling to the floor of the car.

Accommodation was provided for six sitting cases in place of stretcher cases by placing short planks across the rails provided for the lower

stretcher. The full load of the ambulance was therefore six-stretcher cases, or three-stretcher cases and three-sitting cases, or six sitting patients.

The above described system proved so unsatisfactory that the latter part of 1914 saw a new type of body designed by Kellner appear, which has gradually been improved until it is now the standard for the French Army.

The earlier of these ambulance bodies which may be considered to represent the second stage in the development of the French Army type Kellner, is shown in Figs. 2 and 2*a*.

The features of the exterior of these bodies is a fixed roof over the driver's seat, a large window in the front of the ambulance body itself, and two large windows on each side, all of these covered with canvas curtains capable of being rolled up. The rear of the ambulance, through which loading took place, was also covered by a canvas curtain.

An examination of Fig. 2*a* will show that the ambulance had a capacity of five stretcher cases, the lower stretcher being simply slid into place on its legs on the floor of the car, two small strips of wood preventing it from working out of position sideways. The upper four stretchers were all suspended, the stretchers being slid into place suspended from leather stretcher hangers fitted with rollers and moving along metal rods. These stretcher hangers were also fitted with heavy springs, similar to those mentioned in the description of the angle iron canvas type of ambulance.

The stretchers when not in use were rolled up and placed in the stretcher hangers in the center of the car, the stretcher hangers on the sides of the car being strapped together to prevent vibration, the noise of which was most annoying if this was not done. The body of the ambulance being much longer than the stretchers themselves, this arrangement was fairly satisfactory as the stretchers were entirely under cover.

Seating capacity was provided for eight patients, on two seats running lengthwise on each side of the car. The total capacity of the car was, therefore, five stretcher cases or two stretcher cases and four-seated cases, or eight-seated cases. The loading of these ambulances was extremely quick and simple, and on account of the front and side windows, the operation could be overseen by the driver, who could thus easily prevent the rollers of the stretcher hangers from jamming.

Experience soon demonstrated that the most comfortable stretcher for the patient was that one placed on the floor of the car, and that a suspended stretcher was a fallacy, as the motion of the car caused it to swing sideways, and thrust backwards and forwards in the most violent

manner, causing very great discomfort, and even danger to the wounded. Many makeshift arrangements were tried to prevent this, the most effective and simplest being to bore two holes in the side of the ambulance opposite the end of each stretcher, pass a thin rope through and tie the end of the stretcher to the side of the car.

Another great disadvantage with this form of ambulance was the cold in winter and the dust in summer. This latter was simply terrific, the patients being almost suffocated as it sifted in through the canvas curtains on the sides and back of the car. On warm days, however, this could be partially prevented by raising the curtain of the front window back of the driver.

The final development of the French Army ambulance body type Kellner is illustrated in Figs. 3 and 3*a*. It will at once be seen that, in general lines, this final type is similar to the one just described, but has several important modifications. Firstly, the fixed roof over the driver's seat is replaced by a hood of the buggy type, which can be folded back. This is of importance, as on dark nights, when driving without lights near the front, it enables the driver to keep on the road by looking up at the skyline which shows between the trees that invariably line the roads in France. Secondly, the canvas curtains of the windows and back are replaced by wooden shutters. These on the rear of the car have not given satisfaction, as, when the car is standing loaded on an uneven portion of the road, the body will warp slightly out of shape, and a great deal of difficulty is experienced in opening or closing the rear shutters. Thirdly, the four upper stretchers, instead of being suspended, all rest on slides, these slides folding up against the central pillar when not in use. This arrangement is most satisfactory, as it combines with quickness of loading, the greatest amount of comfort for the wounded man himself. Note should also be taken of the large boxes on each side of the car; these contain the reserve gasoline, the tools, and the driver's personal baggage.

No provision has been made in this type of body for the stretchers when not in use, but the writer sees no reason why a shallow box capable of containing them should not be placed in the seats which run lengthways along each side of the car, the top of the seat being the lid of the box.

Heating arrangements are made by turning the exhaust gases of the engine into a sheet iron box placed in the floor of the body. This can be turned off and on at will and gives excellent results. The capacity of these bodies is the same as the one previously described, namely, five stretcher cases, or two stretcher cases and four sitting cases or eight sitting cases. These bodies were placed on all makes and powers of chassis, but the writer, through personal experience and observa-

tion, is of the opinion that a chassis of from 12 to 15 horsepower (European rating) gives the best results, as a high-power car is a luxury and not a necessity. This opinion is apparently being shared by the French authorities, as the later sections are all composed of 12 to 15-horsepower chassis.

The chassis should have great clearance, with equal size tires and detachable rims on all four wheels, the section of the tires being at least 4½ inches. The most desirable power plant is of the unit variety, having the engine and gear box in one piece, with the fly wheel encased in the casting of the motor base to protect it in case of hitting any abnormal object, such as a dead horse, etc.

Only the very highest grade of car should be used and should have electric lights, as in frontal work the lights are continually extinguished and relit at very short notice. A self-starter is only a complication. An electric light should also be placed in the interior of the ambulance. Double tires on the rear wheels give excellent results.

A section which almost absolutely fitted the above description came under the observation of the writer. It was composed of 12 horsepower Panhards, and, with the exception of not having a very great clearance, was certainly most effective.

ORGANIZATION AND PERSONNEL OF AN AMERICAN VOLUNTEER SANITARY SECTION ATTACHED TO THE FRENCH ARMY

The sanitary sections of a French Army are not, as might be supposed, under the command of the ranking medical officer of that army, but have as their chief an officer under whose charge all the automobiles of the army are placed. This officer, usually a major, has, as his immediate assistants, two captains, who in turn are responsible for all of the automobiles of the two army corps which compose a French Army, one being assigned to each of the Army Corps. It is to one of these captains that the officer commanding a sanitary section is immediately responsible.

The officers and personnel of an American volunteer sanitary section consist of, and are organized in somewhat the following manner, though the numbers vary slightly from time to time. The minimum time of enlistment is six months:

Commanding officer: a second lieutenant of the French Army. Bookkeeper: a sergeant of the French Army. American officers under the command of the French lieutenant: a Chef de Section; a Sous Chef de Section. Personnel: one chief mechanic (American), one assistant mechanic (American), one cook (usually a French soldier), one assistant cook (usually a French soldier), twenty-four drivers (American),

twenty-three assistant drivers (American), a French soldier who acts as chauffeur to the lieutenant commanding.

In Paris a bureau is established under the command of a French Army captain, whose duty it is to see that the sections are maintained to proper strength, that the recruits are suitable, and that the material is kept up to the proper standard of perfection, but this bureau has nothing to do with the operation of the sections in the field.

The French second lieutenant, the French sergeant, the French cook and assistant cook, and the chauffeur, all receive the usual pay and rations of their various grades in the French Army.

The American Chef de Section receives from the French Army the lodging and rations of a captain, but no pay. The American Sous Chef de Section receives the lodgings and rations of a lieutenant from the same source, but also receives no pay.

The American personnel of the section receive the pay and rations of a simple French soldier, the pay being 5 cents a day. They do, however, have an extra allowance made them by the organizations that are financing the undertaking. This varies from one franc per head per day in the American ambulance sections, to three francs in the American Red Cross. The mechanic and assistant mechanic are usually professionals and receive regular wages from the financing organizations.

A French officer not being allowed to drive his own car, the American Chef de Section and Sous Chef de Section come under the same ruling, so that a driver is assigned to the staff car, used by them.

The matériel and make-up of a section vary considerably, but the following may be taken as a very fair average:

One touring car, used by the French second lieutenant, and in charge of the French soldier. One touring car, used as staff car by the American Chef and Sous Chef de Section, and in charge of American volunteer driver. One large truck with trailer, in charge of American volunteer driver and assistant driver. One kitchen truck fully equipped with stove, etc., in charge of cook and assistant cook. One repair truck fully equipped, tools, forge, vice, etc., in charge of mechanic and assistant mechanic. One small light truck, in charge of American volunteer driver and assistant driver. Twenty-one ambulances, each in charge of an American driver and assistant driver.

Gasoline and tires are furnished by the French Army, the serious repairs being attended to in the shops established close to Paris, by the financing organizations, in the case of the American Ambulance at Kellners, ———, and, for the American Red Cross, at ———.

Each car must carry enough gasoline and oil to be able to run 300 kilometers (about 187 miles), and, besides a regulation list of tools, must carry two new exchange tires and four inner tubes. A further

reserve of one tire for each two cars is carried in the camion, which also carries the working supply of gasoline—about 1,000 liters.

The equipment for housing the men in some cases consists of two large tents, each capable of sleeping twenty-four. These are carried on the trailer dragged by the large truck. These tents are not always used, better quarters being frequently found in barns, schoolhouses, etc.

The personal equipment of the men includes a folding canvas cot a sleeping bag, and at least two heavy blankets, though in some of the sections, the sleeping bag has not been served out.

If a section remains for any length of time in a given sector, the large camion will be used to transport the gasoline supply, disinfectants, etc., while the small camion will haul the daily rations and supplies for the section itself. In very busy times both the large and small trucks can be used to evacuate sitting cases, thus relieving some of the strain on the ambulances themselves.

The above scheme of organization, of which only a rough idea has been given, was arrived at after considerable experimenting, but it now seems to work quite well. The weak points are the French lieutenant, who rarely understands the American character, and who sometimes does not even speak English, and the short time of the enlistment of the volunteers themselves—six months. A man just becomes thoroughly trained and really valuable in this period; then he leaves, with the result that considerable energy and time are spent in breaking in new men. This very naturally takes away from the efficiency of the section.

A full section is usually assigned to a division, and is almost invariably quartered in the town in which the headquarters of the division itself are established. The "Médecin Divisionnaire," as the ranking medical officer of a division is called, having organized his sector with the first aid stations, hospitals, etc., the lieutenant commanding the sanitary section proceeds to organize the transportation. The details and workings of this will be described under another heading.

EARLY EXPERIENCES—SECOND LINE EVACUATION WORK

February to June, 1915, found the writer in charge of an American volunteer automobile ambulance corps, composed of several ambulances, and working under the charter of the Hôpital Militaire du Val de Grâce, of Paris. The necessary funds for this corps were furnished by Mr. Herman Harjes, the well-known banker.

During the above-mentioned period, the corps was assigned to the Evacuation Hospital of ———, which included all of the hospitals in the town itself, as well as those within a radius of 10 kilometers of the town.

The medical officer commanding this sector, or group of hospitals, held the rank of lieutenant colonel, and it was from him that the ambulance corps received its orders.

The organization of this corps was extremely primitive, the personnel being as follows:

Officers.—One American in charge of the ambulances with the title of Chef des Ambulances. One French sergeant detailed from the "Hôpital Militaire du Val de Grâce," Paris, Officer de Liaison.

Men.—One cook (salary paid by Mr. Harjes); two mechanics (salary paid by Mr. Harjes); five to seven drivers, all volunteers, the number being never less than five, never more than seven.

Quarters for the corps were provided in the château of ———, lent by the owner for this purpose, situated about 4 kilometers from ———. The ambulances, the salary of the cook and two mechanics, the food, the men's uniforms and equipments were all furnished by Mr. Harjes. The gasoline, oil, and tires were supplied by the French Army, at the order of the lieutenant colonel commanding the ——— Evacuation Hospital.

The ambulances themselves were as follows:

Two 6-cylinder, 38-horsepower Packards (body of the old angle iron canvas type).
One 4-cylinder, 30-horsepower Packard (body of the old angle iron canvas type).
One 4-cylinder, 35-horsepower Renault (body of the old angle iron canvas type).
Two 4-cylinder, 24-horsepower Panhards (body of the old angle iron canvas type).
One 4-cylinder, 35-horsepower Panhard (body of the old angle iron canvas type).
One 4-cylinder, 12-horsepower Motobloc (body of the American Ambulance four-stretcher type).
One 4-cylinder, 35-horsepower Renault (light truck body capable of accommodating six seated patients).
One 4-cylinder, 10-horsepower Berliet (touring car body, for use of staff).

With the exception of the two 6-cylinder Packards, and the one 35-horsepower Renault ambulance, all of the above cars were old, worn out, and out of date, the three Panhards and the Renault truck being constructed in 1907.

The town of ———, which was at that time about 12 kilometers from the first-line trenches, had been organized as a receiving, distributing, and forwarding center for that part of the line immediately in front of the town, or from slightly south of ——— to a little south of ———, a total front of about 18 kilometers.

The hospital of evacuation itself, which served the commanding medical officer as headquarters, was situated in the railroad depot of

the town and was used simply as a receiving, distributing and forwarding station. All sick and wounded from this part of the front were brought to this hospital. The system with its dependent hospitals was organized as follows:

Hospital of Evacuation, in railroad station, receiving, distributing, forwarding station, headquarters of the commanding medical officer. City Hospital, in ———, capital surgical cases. Jeanne d'Arc Hospital, in ———, light surgical cases. Girls' School Hospital, in ———, noncontagious sicknesses. Public School Hospital, in ———, contagious sicknesses. Old College Hospital, in ———, epidemics, such as typhoid, etc. Three houses, in ———, suspected contagious cases kept under observation. Total capacity about 800.

Besides the above, a hospital was established in the school at ———, a town of about 3,500 inhabitants, situated 20 kilometers to the west of ———, but not in direct railroad communication with this latter town. The capacity of this hospital was about three hundred patients, and was used for such slightly wounded and sick as were expected to make a rapid recovery, returning to their regiments without the necessity of a long convalescence at the rear. The evacuations from ——— to ——— were made by the ambulances of the Harjes corps.

Furthermore, a sanitary train passed through ——— every afternoon between 4 and 5 o'clock, coming from ——— in the direction of ———, which latter town was the real receiving center of this entire part of the line.

The manner of sending in the sick and wounded from the front to the evacuation hospital was as follows:

1. Serious cases of wounds or noncontagious sickness were rushed in at once to the evacuation hospital by the automobile ambulances of the division holding that part of the line.

2. The slightly wounded and sick were sent in by a regular convoy of the divisional automobile ambulances—this convoy arriving at ——— every day between 2 and 3 p. m., thus allowing time for the classification of such cases as would be sent away in the sanitary train of that afternoon.

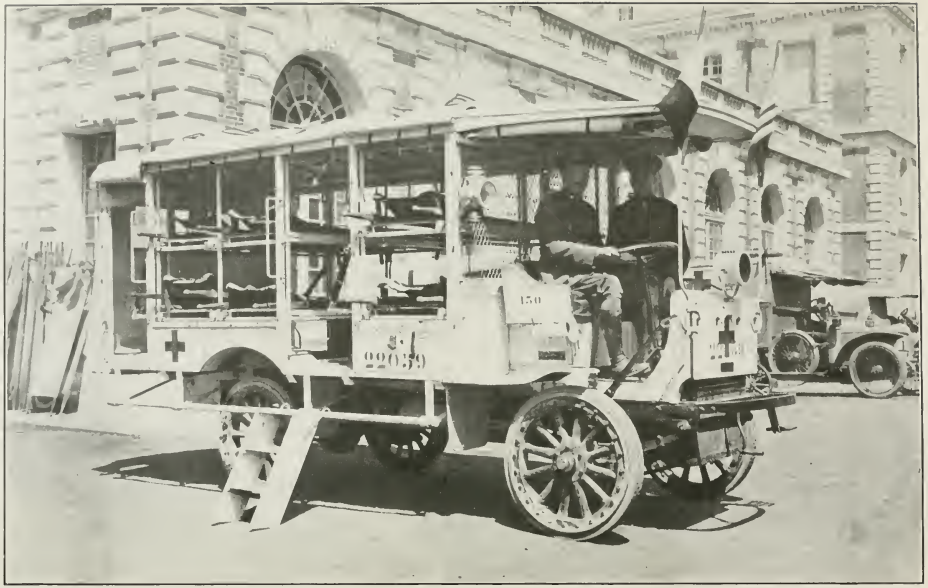
3. Contagious cases were handled entirely by the old-fashioned horse-drawn ambulances.

In order to cope with the above, the distributing service of the Harjes corps was organized as follows:

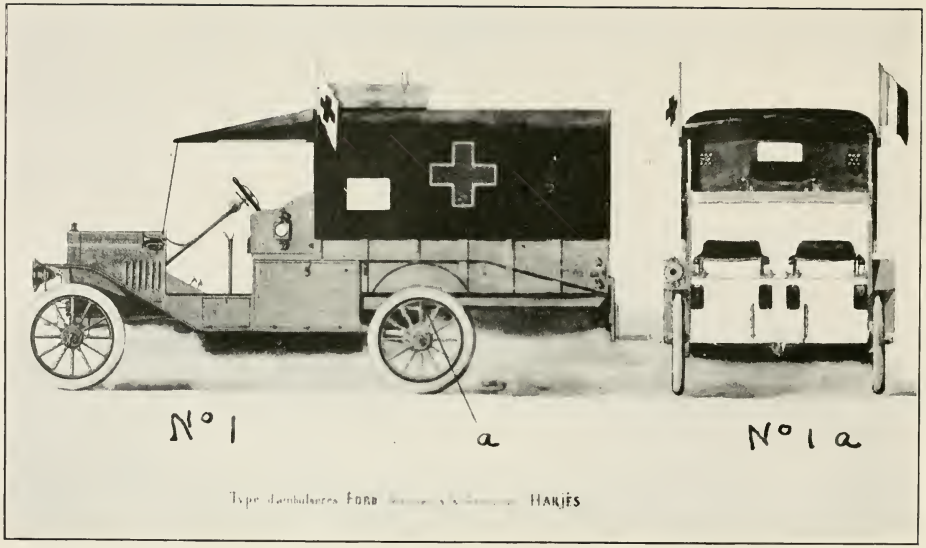
1. One ambulance was kept continually on service, from 8 a. m. to 9 p. m. at the evacuation hospital. This was worked in three shifts, 8 a. m. to 12.30 p. m., 12.30 p. m. to 6 p. m., and 6 p. m. to 9 p. m. respectively. The duty of this ambulance was to distribute such urgent cases as arrived from the front, to transport to the station such convalescents from the ——— hospitals as were

American Ambulance (Neuilly)

(To face page 424.)



Autocar—Old "Bird Cage"



Type d'ambulances FORD [illegible] HARJÈS

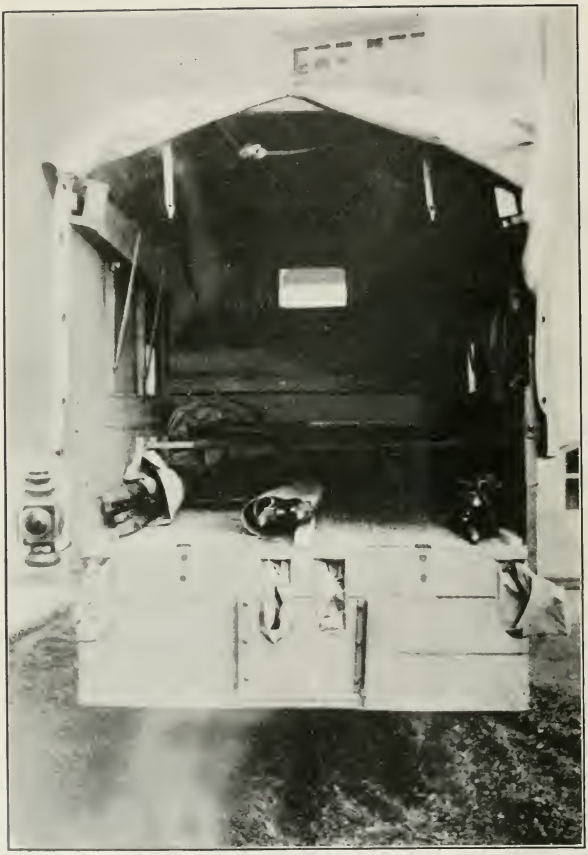
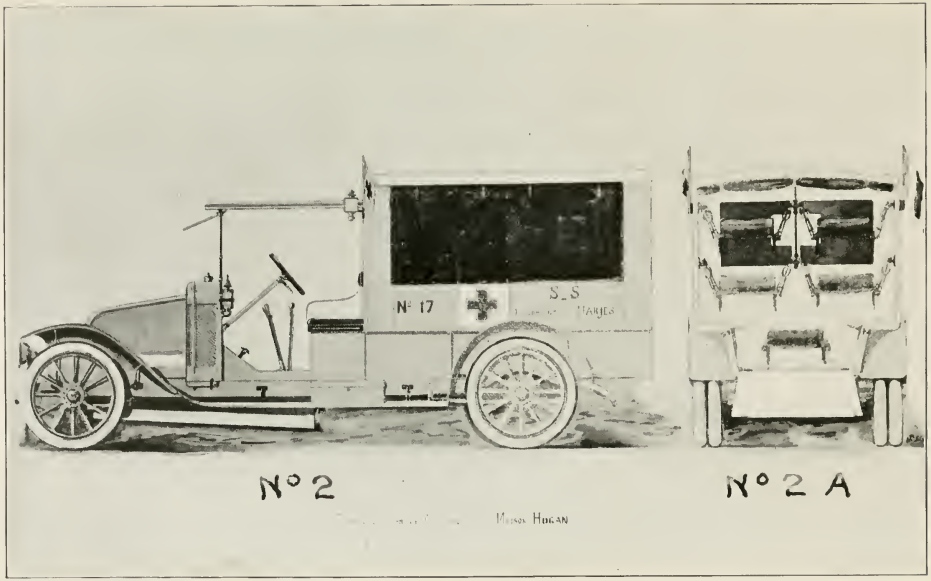


Fig. 1a.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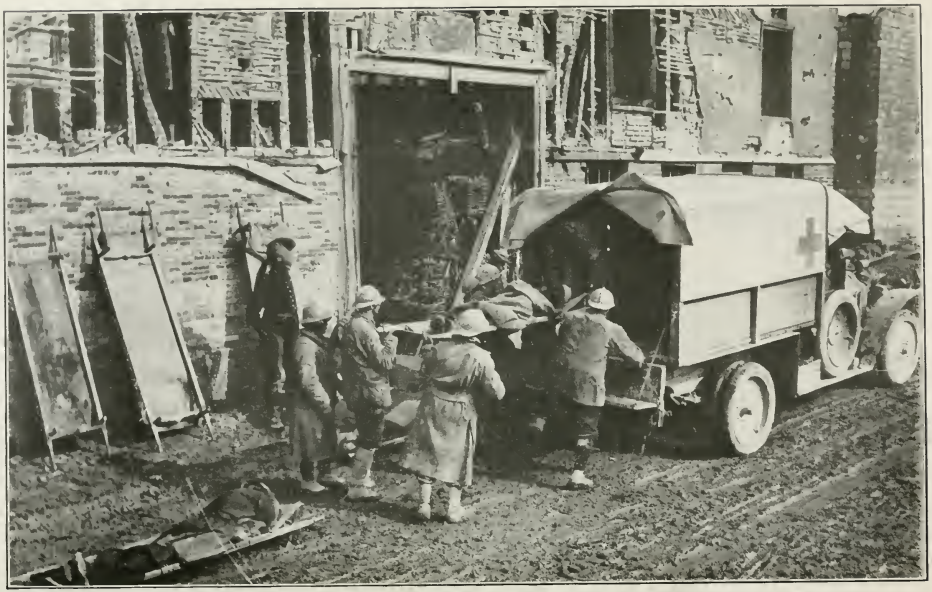

Note Steel Wheels

Ford Ambulance

being sent to the rear on the daily sanitary train, and to distribute the sick and wounded arriving in the afternoon convoys.[1]

2. During the early afternoon, one, two, three, or whatever number of ambulances of the corps ordered by the commanding medical officer, would be sent to help No. 1 in the afternoon distributions and evacuations. These being completed, these latter ambulances would undertake the evacuation of such cases as were being sent to ———.

Each ambulance, when carrying sick or wounded, was accompanied by a French soldier *infirmier*, attached to the evacuation hospital. The duty of this attendant was to see that the ambulances were properly loaded, the papers of the patients in order, etc., a duty that was usually performed in the most slovenly manner, the real responsibility in most cases falling on the driver of the ambulance.

The following figures taken from the notebook of the writer will furnish interesting data on this service:

Date, 1915	Ambulances	Calls answered	Patients carried	Kilometers run
February	7	206	947	3,755
March	7	279	936	5,359
April	7	351	1,042	4,417
May	6	384	909	4,072
Average per car		45.8	142.5	656.4

During the month of June, 1915, the French authorities suggested that the Harjes corps should be increased to fifteen ambulances, and from that time on act as a first line ambulance section. This was accordingly done, or at least nominally done, as three of the older cars were out of commission and waiting for exchange parts.

This reformed corps, known as the "Section Sanitaire Harjes," consisted of ten effective ambulances, one light truck with seating capacity for six patients, and a small touring car for inspection work. The section was manned by ten (shortly increased to eighteen) volunteer drivers, one paid mechanic, and a cook. The writer, in command with the title of "Chef de Section," was included in the above number.

The latter part of June, 1915, the Section Sanitaire Harjes was assigned to the X Division, and ordered to divisional headquarters then established in the town of ———, 10 kilometers north of ———.

No attempt having been made to organize the Section Sanitaire Harjes from a French standpoint, the writer will not describe this period of the service, but the following figures will illustrate the possi-

[1]Seriously wounded arriving at the evacuation hospital between 9 p. m. and 8 a. m. were distributed by the divisional ambulance that brought them in.

bilities of ten ambulances capably and enthusiastically driven. To make matters more difficult, the transfer of the Section Sanitaire Harjes had deprived the ——— hospitals of their ambulances, so that it was found necessary to detach at least two cars each day to attend to this service, thus leaving never more than eight ambulances to take care of the sick and wounded of the entire X Division, at that time one of the strongest in the French Army, having over twenty-eight thousand men in its ranks. During this period, covering two months, no call was kept waiting, and the writer knows of several cases where the wounded man was actually on the operating table in a ——— hospital in between thirty-five and forty minutes after being wounded in the trenches.

July, August and September, 1915

	July	*August*[1]	*September*[2]
Number of ambulances in service	10	10	16
Number of trips, ——— service	253	377	199
Number of patients transported, ——— service	619	1,460	794
Number of trips, frontal service	249	391	519
Number of patients transported, frontal service	584	639	1,617
Number of convalescents returned to regiments	60	142	53
Number of kilometers run	11,050	17,922	19,492
Number of liters of gasoline used	4,611	5,896	6,226

During the month of September the number of cars in the section was increased by the addition of six new Ford ambulances of the American ambulance three-stretcher type, and an old Peugeot transformed into a truck capable of carrying about one and a half tons. A very finely equipped repair truck was also attached to the section by the French Army.

It was during this time that the process of organizing the section from a French army standpoint was undertaken. A second lieutenant of the French Army was placed in command, a French sergeant assigned as book-keeper, etc. But as these changes were not in successful working order until the end of the month, no attempt will be made to describe the operations of the section during this period. The figures given for September will, however, be found of interest.

October found the section rechristened "Section Sanitaire Américain No. 5," incorporated into the American Red Cross, and organized on lines to all practical purposes similar to those described above. Only two really important differences are noticeable: (1) The number of

[1]The enormous increase in the ——— service during the month of August was due to the fact that the Germans had thrown a number of large shells into the town, and, while little damage had been done, it was thought more prudent to evacuate the hospitals.

[2]The increase in the number of patients transported in the frontal service was owing to an attack being prepared to take place in conjunction with the French Champagne offensive of 1915, and though this attack did not materialize, every man not in "A1" condition was sent to the rear.

ambulances had not yet reached its full complement of twenty-one; (2) only one man, the driver, was assigned to each car, an aide driver not being thought necessary at this time.

A number of ambulances from another source having been attached to the ——— hospital system, the S. S. A. No. 5, from this time on, attended only to the frontal work of the division to which it was assigned, the following being a description of the organization and execution of the work during the month of October, 1915.

The headquarters of the X Division had for some time been established at ———, a small village 7 kilometers east of ———, and, as was customary, the S. S. A. No. 5 was stationed in the same village. The ambulances were parked in the public square close to the offices of the commanding general, the office of the *médecin divisionnaire* being also only a short distance away.

The immediate staff of the *médecin divisionnaire* consisted of a second lieutenant in charge of the office, assisted by several bookkeepers, orderlies, etc.; also a so-called *groupe des brancardiers*, or company of stretcher bearers, under the command of a medical officer with the rank of a captain. To this company were attached several young doctors or medical students, known as *médicins auxiliaires*, a dentist and his assistant, an administrative officer, and an *Aumonier* or chaplain. The entire force when at full strength numbered 222 officers and men.

The duties of this *groupe des brancardiers* were somewhat those of a sanitary police for the entire division, attending to such matters as the fumigating of infected houses, etc. They also acted as a reserve force of stretcher bearers that could be sent to any portion of the line especially actively engaged.

The frontal hospitals in charge of the medical authorities of the army corps to which the division belonged were intended to receive only the very lightest cases or very serious non-transportable patients. There were only two of these hospitals in the sector at this time, one situated at ——— to the extreme left, the other at ———, to the extreme right.

During the day, that is to say from 8 a. m. to 8 p. m., the method of evacuation was as follows. A man or men being wounded, divisional headquarters was at once informed by telephone; details of the number wounded, the nature of the wounds, and to what posts the wounded were being taken, were given. This message was written on a telephone blank and dispatched by a bicyclist to the office of the *médecin divisionnaire*. There it would be decided as to whether the case was sufficiently urgent to require the immediate dispatch of an ambulance, also as to whether the patient or patients should be sent to one of the frontal hospitals, or evacuated on ———. The decision made for immediate

evacuation, full instructions were written on the original telephone blank, this being sent by messenger to the office of the S. S. A. No. 5. The lieutenant commanding the section, or, in his absence, the sergeant bookkeeper, would then write out a so-called "order of movement," giving the name of the driver and the number of the ambulance selected for the call by the American Chef de Section, the route to be followed being also indicated. This order of movement, in conjunction with the countersign, served as a pass for the driver and ambulance. At the same time, one of the *médecins auxiliaries* would be instructed to accompany the ambulance on the call. The duties of this *médecin auxiliaire* were to see that the papers of the patients were in order, that the ambulance was properly loaded, to take care of the wounded during transportation, and to see that the patients reached their proper destination.

Notwithstanding the above rather complicated process, which usually took from fifteen to twenty minutes, the ambulances frequently reached the first-aid posts before the wounded, who were being brought in from the trenches by hand. Frequently a single ambulance could be used to answer two separate calls, at two different posts located in the same part of the sector.

The slightly sick and wounded of the division were evacuated daily by a regular service of four ambulances, each accompanied by a *médecin auxiliaire*, these ambulances leaving the park at ——— promptly at 1 p. m. To each of these cars, known as *tournée* cars No. 1, No. 2, No. 3, and No .4, was assigned a separate route obliging it to call at certain posts in the sector, where the slightly sick and wounded of the previous twenty-four hours had been collected from the surrounding district. *Tournée* cars No. 1 and No. 2 evacuated on the frontal hospital of ——— and the evacuating center of ———, while cars No. 3 and No. 4, evacuated on ——— and ———. Each of these four cars made as many trips as necessary to complete the evacuation from all the posts for which it was responsible.

Convalescents collected at the evacuation hospital at ———, were returned to their regiments by these *tournée* cars, but only if the cars was obliged to return empty for more patients, no special trip being taken for this purpose. Otherwise they were obliged to walk, a not very great hardship, as the greatest distance was less than 15 kilometers. Contagious cases were treated separately and carried as much as possible in one car, this being carefully fumigated.

During the night, that is to say from 8 p. m. to 8 a. m., the evacuations were carried on with much less red tape, the *médecin divisionnaire* and the lieutenant commanding the S. S. A. No. 5 being eliminated. Enough "orders of movement," signed in blank to take care of the night

service, were given to the American Chef de Section who, in turn, left these in the sleeping quarters of the drivers, instructing them as to who was the first man out, and the order of rotation. The call on being received by headquarters would be made out in duplicate, one copy being sent to the sleeping quarters of the *médecins auxiliaires*, the other to that of the ambulance drivers. The driver, on receiving his notification, would fill in a blank "order of movement" to correspond, wake up the man whose turn was next and go to his car, there finding the *médecin auxiliaire* waiting for him. All night evacuations at this period were made on ———. The used and unused "orders of movement," as well as the notifications of the call, were turned in to the lieutenant commanding the S. S. A. No. 5 the next morning.

Besides the above-described routine, the dentist and his assistant made their rounds twice a week. The small staff touring car was used for this purpose. The patients requiring treatment would, in the early part of the week, be concentrated in one or two of the larger posts on the right of the sector; in the latter part of the week, in corresponding posts on the left of the sector. Little real dentistry, however, was attempted, the cure for all ills seeming to be the extraction of the tooth.

Notwithstanding the considerable amount of red tape, the organization of the sector as conceived, and put into effect by the *médecin divisionnaire* of the X Division, worked smoothly and well. It must be taken into consideration that the period just described was a very quiet one, and, as no emergency orders had been issued, or preparation made to deal with a sudden attack by the enemy, the writer very much doubts if the organization would have stood the test of such a shock.

The following figures gives the evacuations, etc., covering this period:

October, November and December, 1915

	October	*November*	*December*
Number of ambulances in service	16	18	18
Number of auxiliary cars in service	4	4	4
Total horsepower of all cars in service	....	575[4]	573[4]
Number of patients transported (sitting cases)	1,025	592	610
Number of patients transported (stretcher cases)		62	69
Number of convalescents returned to regiments	....	20	5
Number of kilometers run	16,346	16,576	18,658
Number of liters of gasoline used	4,863	5,484	5,942
Number of trips (all cars)	489	404	479

[4]The horsepower of cars in service is estimated on the European basis, the Ford cars, as an example, being rated at 14 horsepower. This will be referred to under the heading of "Suggestions."

During the month of November, the X Division was moved to the rear to rest, the Y Division taking its place in the sector. The S. S. A. No. 5 at the same time was transferred from the X to the Y Division, with instructions to continue the work from its old quarters at ———.

The arrival of the new *médecin divisionnaire* was the signal for a general reorganization of the frontal hospital system of the sector, the hospital at ——— to the extreme left being closed, and its place taken by ——— and ———, 8 and 4 kilometers (respectively) south of ———, ——— was a small chateau intended to receive the overflow from ———.

To the right of the sector, a hospital was opened in the ———, about 6 kilometers from the existing hospital at ———, and intended to receive the overflow from this latter institution.

Furthermore, on the extreme right of the sector, two other new hospitals were opened, one in the ———, the other in the ———. These two hospitals handled only special cases— ———, head cases; ———, eyes and ears—and received patients from both of the divisions forming the army corps.

The actual evacuation of the sick and wounded, under the new *médecin divisionnaire*, was carried on in much the same manner as described in a previous part of this chapter, with three slight differences: (1) The *groupe des brancardiers* of the Y Division had no *médecin auxiliaire* attached to it, thus throwing the entire responsibility on the ambulance drivers. This also obliged a second driver to act as assistant on all night calls. (2) An attempt was made to classify all night evacuations, by instructing the regimental surgeons as to which of the various frontal hospitals each class of case should be sent. This proved a failure and the cause of endless confusion, as no attempt was made to find out if there was room in the hospital selected, besides which a not infrequent error in the diagnosis would make the class of case unsuitable for that hospital. After several experiences with ambulances, loaded with badly wounded, spending half the night strolling from hospital to hospital, and in the end being obliged to evacuate their patients on ———, a vigorous protest from the writer requesting the *médecin divisionnaire* to either keep his office open all night or to return to the system of evacuating all night patients on ———, decided that officer in favor of the ——— plan. (3) Lunatics were evacuated on ———, 42 kilometers to the west, a permanent state asylum being situated near that town. Special cases of nervous disorders were sent to ———, 35 kilometers to the east. ——— was the headquarters of the chief medical officer of the army of which the Y Division formed part.

The *médecin divisionnaire* also issued detailed instructions to the *groupe des brancardiers* and ambulances for the handling of the wounded resulting from various forms of attack.

During the month of November, the number of ambulances in the section was increased to twenty-one, by the addition of two new cars and the repair of one of the old ones. Only eighteen ambulances were used, however, three being held in reserve.

The following subject dealt with, being written from memory without the use of notes, probably contains a number of slight inaccuracies. In order to avoid the possibility of giving a false impression, the writer has only dealt with conditions and incidents that came under his personal observation.

The latter part of February, 1916, the S. S. A. No. 5 was ordered to the rear to refit and repair the ambulances, many of which, especially among the older cars, were by this time in a deplorable condition. Before any real work could be done in this direction, however, the order was countermanded, the entire section receiving instructions to proceed by road to the ——— district, a distance of about 300 kilometers. Delayed by a heavy fall of snow, it was not until three days later that the S. S. A. No. 5 joined its old army corps, composed of the X and Y Divisions, which had come on by train, as part of the reinforcement to the ——— Army.

The army corps, concentrated in a number of small villages about 35 kilometers southwest of ———, was being held in reserve, so that during this period the work of the S. S. A. No. 5 as well as that of the other section attached to the corps (one section for each division) consisted of ordinary routine only, such as the evacuation on ——— of the few sick of the corps, the distribution of new gas masks, etc.

During the morning of March 8 the army corps took up its position in the first line. Headquarters being established at ——— about 11 kilometers behind the trenches, the S. S. A. No. 5 and its companion section being located at ———; headquarters of the X Division, 4 kilometers to the west of ———.

Owing to the cancelling of the order to refit and repair, the S. S. A. No. 5 now consisted of sixteen effective ambulances. The personnel was also in a weakened state, only ten trained drivers being available, the rest, including the aid drivers, were new recruits lately arrived from the United States.

The temporary base hospital of ———, situated on the southern outskirts of the small town of that name, was composed of a number of large portable wooden houses, arranged in avenues and streets, but so badly conceived was the plan on which these houses were set up, that

not only was there but one gate serving both as entrance and exit but to make matters worse, the receiving ward was in one of the houses furthest away from this gate, the avenue leading to this ward being so narrow that it was out of the question for two ambulances to pass. Moreover, so restricted was the open space in front of the ward, that it was only with the greatest difficulty that the larger ambulances were able to turn around. Owing to the above arrangement, only one ambulance could enter at a time, and the writer feels convinced that the receiving capacity of this hospital was not more than five to six ambulance loads per hour. As five or six different sections were evacuating their stretcher cases on ——— the congestion was terrific, an ambulance often being obliged to wait in line three or four hours before being able to discharge its load of wounded. Needless to say, many of the most serious cases died in the cars owing to this needless delay.

In the succeeding hospitals of this nature, this fault was remedied, the cars driving in one side and out the other, several ambulances being able to unload at the same time, but it seems inconceivable that the fault should have existed at all.

A full section of twenty British Red Cross ambulances was attached to this hospital at ———, the transportable cases being evacuated on ———, about 45 kilometers by road to the rear.

By noon of the eighth of March, both the S. S. A. No. 5 and its companion section were installed in their new quarters at ———. The X and Y divisions not yet having taken contact with the enemy, it was decided that for the present one of the two sections would be sufficient to attend to the work of the sector for both of these divisions. This duty was accordingly assigned to the companion section, the S. S. A. No. 5 being instructed to hold itself in readiness to assist in the evacuation of the wounded of an adjoining division, where the pressure was being more heavily felt for the time being.

The service of the sector at this time consisted of the night evacuation of the three first aid posts, at ———, ———, and ———, none of the three being practical in the day, and all three evacuating on the divisional ambulance at ———. Also the day evacuation of the second line posts at ———, ———, and the third line posts at ———, ——— and ———, as well as the evacuation of such cases as could be moved from the divisional ambulance at ——— itself, all of these evacuating on "tent city" ———, or ———.

During the early afternoon of the eighth, the S. S. A. No. 5, received orders to send ten of its available ambulances to evacuate the transportable cases from the ambulance of an adjoining division, situated in a large church at ———, 10 kilometers northeast of ———. This

was accordingly done, the ambulances starting almost immediately, the remaining six ambulances of the section being held at ——— in reserve.

About 2 a. m. on the morning of the ninth, the squad operating at ——— telephoned for help, and the remaining six ambulances were at once dispatched to their assistance. These latter, on arriving, found conditions more than serious. Firstly, on account of the congestion at the temporary base hospital of ——— (referred to in a previous paragraph) the ambulances had only been able to make two trips per car up to that time, or a total of twenty car loads in twelve hours. Secondly, the hospital at ——— was now full, so that all future evacuations of stretcher cases were to be made on ———, a round trip of 75 kilometers from ———, and this over roads congested with all forms of traffic, convoys of motor trucks, artillery, infantry, etc. Thirdly, other ambulances were bringing in fresh wounded from the front faster than they were being evacuated by the cars of the S. S. A. No. 5. Fourthly, the French had planted a perfect nest of batteries of all calibers just outside of the town, and a terrific artillery duel being in progress, it became evident that the ambulance itself would have to be evacuated and abandoned as soon as possible, for though the church in which it was established had not up to this time been hit, the German shells were falling fast and had caused quite a number of casualties in the town.

The S. S. A. No. 5 set to work with a will, but it was not until 6 a. m. on the morning of the tenth that the ambulances were able to return to their quarters at ———, the operation completely terminated. About seventy loads of wounded in all were evacuated from ———, some of the drivers and cars having been on duty for forty consecutive hours, during which time the ambulances were run on their reserve supply of gasoline, the drivers living on the two days' emergency rations always carried in each car. On returning to quarters, the personnel was ordered to take six hours of sleep and report for duty at noon.

During the night of the eighth and ninth, and the ninth and tenth, the X and Y divisions were in contact with the enemy, with the result that the companion section had been unable to attend to anything but the absolute frontal work, leaving a twenty-four hours accumulation in the rear posts of ———, ——— and ———. This the S. S. A. No. 5 was instructed to clean up, these instructions being carried out, and the work terminated in the early hours of the morning of the eleventh.

By noon of the eleventh, orders were received that changed the entire scheme of operating. Firstly, "Tent City," ——— and ——— were no longer to be used by the X and Y divisions as an evacuating

center, their place being taken by two new temporary base hospitals opened at ——— and ———. Evacuation of stretcher cases from all of the posts of the first and second line (———, ———, ———, ———, ———) to be made on the divisional ambulance at ———, or when this institution was full on the temporary base hospital at ———. All sitting cases were to be taken to the post at ———. The divisional ambulance at ——— and the post at ——— evacuated, their transportable cases on the temporary base hospital at ———. Both ——— and ——— evacuating on ———, a full section of ambulances being stationed at ——— for this purpose. The third line posts at ——— and ——— were no longer in the sector of the X and Y divisions.

Secondly, it was decided that from this time on the S. S. A. No. 5 and its companion section were to share both the front and rear work. The shifts being arranged in somewhat the following manner:

6 p. m. (dark) to midnight, C. S., evacuation of frontal posts of ———, ——— and the ———; midnight to 6 a. m. (dawn) S. S. A. No. 5, evacuation of frontal posts of ———, ——— and the ———; 6 a. m. to noon, C. S., evacuation of second and third line posts of ———, ———, ——— and ———; noon to 6 p. m. (dark), S. S. A. No. 5, evacuation of second and third line posts of ——— ———, ——— and ———.

Both morning and afternoon shifts if not too busy were liable to be called on to assist in the evacuation of the third line posts of ——— and ———, now in the sector of an adjoining division. Both of these posts received only sitting cases and evacuated on "Tent City."

The order of rotation of the two sections could be changed if found advisable, by the simple method of skipping the 6 a. m. to noon shift. This service was never of much importance, as the time between these hours was usually employed by the doctors in the various posts in classifying the patients received during the night. This, however, was never done, the work as scheduled above seeming to balance itself with great fairness, for while the S. S. A. No. 5, with the noon to 6 p. m. shift, would often be on service until 10 or 11 p. m. before being able to clear all of the posts assigned to it, on the other hand the C. S. would frequently succeed in evacuating all of the frontal posts before midnight, in which case the S. S. A. No. 5 would be obliged to send out only a few cars if any at all.

The following description of the night evacuation of the first aid post at ———, is cited as being a fair example of this class of work, this particular night being selected on account of its being the first in which the S. S. A. No. 5 participated, and for this reason the details seem to be more firmly fixed in the mind of the writer.

Shortly before midnight of March 11 to 12, the orders for the mid-

night to 6 a. m. shift were received at the quarters of the S. S. A. No. 5; these in effect were as follows:

1. Two ambulances to be stationed at the ———. These to evacuate stretcher cases on ———, sitting cases on ———. The post of ——— being on the extreme left of the line held by the X and Y divisions was never of much importance, and rarely required more than two cars in attendance.

2. The pressure on the line in front of ——— had not been severe, and that post was already cleared of wounded, the S. S. A. No. 5 were therefore instructed to continue the work of the companion section in the evacuation of the post at ———, where there still remained quite a large number of badly wounded who must be evacuated before dawn, as the road leading to that town was in plain sight of the German lines. All stretcher cases to be evacuated on ———, sitting cases to ———. *No lights to be used.* From this time on no lights were used anywhere in the sector, except on a very few of the more sheltered roads well to the rear.

At midnight, as ordered, two cars were dispatched to the ———, the remaining effective cars of the section, twelve in number, taking up their position in the main street of ———, 5 kilometers from ———. The cars were drawn up in Indian file, 100 meters between each car, in order that not more than one car would be destroyed by a single shell The night was very cold with about one centimeter of frozen snow covering the ground, and though this made it much easier to follow the road in the dark, it was feared that the ambulances would be seen by the enemy when crossing the open road leading to ———.

Fourteen freshly wounded were found in the post at ———, and two ambulances were detailed to evacuate these on ———, with instructions to rejoin the section as soon as possible.

About 12.45, the last ambulance of the companion section came out from ——— with a full load of badly wounded. The driver of this car reported that the road leading to ——— and the town of ——— itself were being very heavily bombarded, a statement easily believed as the shells were now falling close to the position occupied by the S. S. A. No. 5 in ———.

On receiving the above information, two ambulances were at once dispatched to ———, two others following in twenty minutes, and two more after another interval of twenty minutes, etc., these cars discharging their wounded at ——— or ———, as the case might be, and returning to the station at ——— as rapidly as possible. And so, at the rate of six carloads an hour, the work of evacuation was carried on for the remainder of the night, the last of the wounded being success-

fully brought in just as dawn was breaking. Twenty-four ambulance loads, almost all stretcher cases, being evacuated by the S. S. A. No. 5 alone.

Considering the intensity of the bombardment, the casualties were remarkably light. One unfortunate brancardier had his legs blown off while loading an ambulance. One ambulance was slightly damaged by a shrapnel ball, and a second ambulance (fortunately empty), having fallen into a shell crater, was abandoned, but rescued undamaged the next night.

From this time on, the work in the sector continued in much the same manner, and should need no further description. One point, however, is of interest, and that is the length of time a sanitary section can work under the strain of a great battle, without being sent to the rear to rest the personnel and repair the cars. The writer trusts the following paragraphs will shed some light on this subject.

The companion section to the S. S. A. No. 5, having had the misfortune to lose two or three cars and one or two men by shell fire, was commencing to show a certain amount of demoralization, and was accordingly ordered to the rear on the fifteenth of March, having been in action but seven days. Of these seven days, however, the section had done the entire frontal work for two full divisions for four days, and one-half of the frontal as well as one-half of the rear work for the same divisions for the remaining three days.

On the nineteenth of March, the S. S. A. No. 5, having only ten effective ambulances left, with a personnel so exhausted by overwork that the entire unit was practically worthless, were ordered to the rear, having been in action eleven days. During four of these eleven days, the section executed all of the rear evacuations for two full divisions as well as part of the rear evacuations for a third division. For the remaining seven days, this same section attended to one-half of the front and one-half of the rear work for two divisions.

Both of the sections relieving the S. S. A. No. 5 and its companion section, remained in the sector two full weeks; the writer having the opportunity to inspect one of these sections on its arrival at the rear, found it in almost perfect condition and quite ready to return to the front after the personnel had been allowed a much needed rest of a week or ten days. It must be said, however, that both of these relieving sections worked in an organized sector, and did not have the trying experiences of the first days of the battle, with its unavoidable confusion and lack of organization.

Taking everything into consideration, the writer sees no reason why a well equipped and thoroughly disciplined section should not be relied

upon to continue its service in the battle line (even under the most trying conditions) for at least two full weeks.

The following translation of a General Order of the X Army, published under date of April 3, 1916, may be found of interest.

GENERAL ORDER NO. 83

The general commanding the X Army mentions, in dispatches of that army, *The Section Sanitaire Americaine No. 5* (Harjes) during a period of eleven days of combat, from the eighth to the nineteenth of March, did the work of evacuation over a zone particularly violently bombarded by the enemy's artillery, displaying an absolute contempt for danger. Furthermore, the personnel gave proof of a remarkable endurance and devotion, in assuring the maximum of efficiency of this unit by serving an average of nineteen hours a day.

(Signed) PETAIN,
The General Commanding the X Army.

The following opinions are simply those of the writer, and should be regarded in that light only. The writer, however, feels convinced that his views on this subject are of value. Not only owing to the fact that he has been connected with the automobile industry both in Europe and the United States for the last seventeen years, but also having toured extensively on the continent and at home, he is familiar with conditions on both sides of the Atlantic. This, combined with nineteen months' experience in the ambulance service with the French Army, should, he believes, entitle his views to carry a certain amount of weight.

The Chassis.—In selecting the type and make of chassis to be used in the formation of an ambulance section, that is to say, the chassis for the ambulances themselves, as well as the chassis for the auxiliary cars, such as the kitchen truck, the repair truck, the officers' staff car, etc., the following general points should be kept in mind: (1) The nature of the country the section is to operate in; (2) only the highest grade of construction and material should be considered; (3) standardization combined with simplicity and a reasonable amount of lightness; (4) as great an amount of clearance as possible without interfering with the stability of the car.

In Europe it has been demonstrated that a motor developing from 12 to 15 horsepower (European rating) will furnish ample power for a frontal ambulance fitted with a Kellner five-stretcher body. That is to say, if a 4-cylinder engine be used, each cylinder would have a bore and stroke approximating: bore, 80 mm.; stroke, 120 mm. The conditions in the United States, however, being quite different, on account of the bad roads and the generally more difficult nature of the country,

an engine of this size would hardly give enough power to handle a chassis fitted with so heavy a proposition as a Kellner five-stretcher ambulance body.

In the opinion of the writer, the problem resolves itself into two distinct parts: (1) The medium powered five stretcher ambulance, type Kellner (for service in the middle and eastern States). (2) The light three-stretcher ambulance, American ambulance type (for service in Mexico and the Western States).

Both types present advantages and disadvantages peculiar to each. The five-stretcher ambulance with its greater carrying capacity, not infrequently finds itself in difficulties in country the lighter three-stretcher car negotiates with ease. The light three-stretcher car on the other hand is obliged to make practically two trips to every one of the larger ambulance. A very important consideration when a great number of wounded must be evacuated in a given time.

A 4-or 6-cylinder gasoline engine (of the pocket valve type in preference to the "sleeve" or so-called silent Knight type) will supply the required power for the type of ambulance under discussion, the bore and stroke of each cylinder being approximately as follows: 18–20-horsepower 4-cylinder engine, bore, 95 mm.; stroke, 140 mm.; 18–20-horsepower 6-cylinder engine; bore, 80 mm.; stroke, 120 mm.; or their equivalent.

The writer prefers the 4-cylinder type on account of its greater simplicity.

All 4 or 6 cylinders should be moulded in a single casting, this method possessing the double advantage of producing a much more compact engine as well as considerably simplifying the water connections, and in this way lessening the chances of water leaks, due to broken pipes or faulty gaskets. The valve springs and valve stems should be enclosed in a metal housing easily removed.

In small or medium-sized engines of this nature, the gravity or thermo-siphon system of water circulation may be used with success. The writer, however, very much prefers the system in which a pump is employed, this latter giving better results in hot climates or hilly country.

The oiling system commanded by a pump situated in the motor base may be either of the "Splash" at constant level or of the forced feed type.

The carburetor, practically all types of which are now automatic, should be fitted with a needle valve adjustment to the jet. Frequently, excellent results may be obtained from a so-called auxiliary air inlet. This, in principle, consists of a flexible metal tubing running from the

intake pipe to a position sufficiently convenient to the driver's hand, where, by means of a device he can weaken the mixture passing from the carburetor to the explosion chamber, by allowing a supplementary amount of air to enter. At certain engine speeds an intelligent driver can effect a considerable saving in gasoline by this means.

The most convenient place for the gasoline tank on chassis of this type is the dash board. This tank should have a capacity of at least 60 litres. Estimating the consumption of gasoline in a service of the nature of mbulance work at one-half of a liter per hour per horsepower (European rating), the tank would then contain sufficient fuel to enable a 20-horsepower car to execute a non-stop run of at least six hours. A tank in this position, besides assuring an excellent flow to the carburetor, relieves the space under the driver's seat, which can then be used for storage or lockers. Under no circumstances should the tank be swung under the rear of the frame, as is customary in many makes of touring cars, for not only is it too apt to be hit by road obstructions in that position, but, on account of the overhang of the body, it cannot be filled without unloading the paitent in the lower stretcher, should there happen to be one.

At this point the writer wishes to call attention to the economy in gasoline consumption (or its equivalent, gain in running time) effected by employing small or medium powered engines; the saving of even a few horsepower per car giving a total result for an entire unit which is well worth considering. Referring to the table given on page 439, it will be noted that the S. S. A. No. 5, having eighteen ambulances and four auxiliary cars in service, with a total horsepower of 523 (average horsepower 23.8) consumed during the month of November, 1915, 5,484 liters of gasoline.

By using the rough formula quoted above (one-half of a liter per hour per horsepower) the following is obtained:

$5{,}484 \div \frac{523}{2}$ = the approximate number of hours run by the section as unit, or the average number of hours run by each car = 20.9.

If on the other hand an equal number of cars, of slightly smaller engine-power per car, be taken into consideration, and it be assumed that the same amount of gasoline has been consumed, that is to say: Number of cars, 22. Horsepower per car, 20. Total horsepower of the unit, 440. Total amount of gasoline consumed, 5,484 liters. The result arrived at is:

$5{,}484 \div \frac{440}{2}$ = the approximate number of hours run by the section as a unit, or the average number of hours run by each car = 24.9.

Or, with only the small difference of 3.8 horsepower per car, the latter example has a running time of 19.1 per cent, more than the former.

The most advantageous form of power plant for this rough work is of the "block motor" type, meaning by this, one in which the motor and the gear box are in one mass, the fly wheel and the clutch being encased in a casting connecting the motor base and the gear box itself.

This point is of great importance, the fly-wheel being thus protected, should the car meet with one of the too frequent accidents of the front, such as falling into a shell crater, running over a dead horse or log, etc.

The suspension of the "block motor" or power plant should be of the three-point type. This method allows the frame to work slightly, when running over very uneven ground, thus minimizing the risk of breaking the supporting arms of the motor, or throwing the motor itself out of alignment.

The gear box should contain four speeds forward and one reverse, the control of these being on the "selective" principle, and the transmission to the rear wheels should be by shaft and "live axle."

The steering column should be set as near the perpendicular as practical, that is to say at an angle of between 52 degrees and 55 degrees in reference to the frame. This arrangement allows the ambulance body to be placed as far forward as possible. By referring to drawing No. 2, it will be noted that the long overhang in the rear is largely due to the excessive rake of the steering column.

To still further reduce this overhang the chassis should have a long wheel base, about 3m50 being the limit for the size and power of car under discussion. This would leave approximately 2m80 from the dashboard to the end of the frame on which to place the body. Allowing about 1m10 for the driver's compartment and 2m30 for the ambulance body proper, the overhang would then be m.60, a not too serious proposition.

Good brakes are most important, the usual equipment consisting of a running brake operated by a foot pedal, and an emergency brake controlled by a hand lever. In many cars both of these brakes work on drums on the rear wheels, one attacking the drum on the outside, the other on the inside. This system has the advantage of throwing no undue strain on the driving mechanism of the chassis, but to counterbalance this there are two decided disadvantages. In the first place, these brakes do not compensate on corners, both rear wheels being apt to lock at the same time, in which case a disagreeable and perhaps dangerous "skid" is experienced. Besides this, oil frequently leaks out

of the "live axle" on to the brake drums and shoes, seriously interfering with their efficiency. Another practice adopted is to place the running brake on the shaft, this brake operating on the rear wheels through the differential, and though throwing a considerable strain on that organ, this latter system is much more efficient than when placed with the emergency brake on the rear wheels.

The spring suspension of a frontal ambulance presents a difficult problem, requiring springs sufficiently flexible to ride easily with a light load of one badly wounded man on a stretcher, or to have the necessary strength and stiffness to support a full load of eight patients.

Should the chassis be equipped with wooden wheels, it is advisable to have these fitted with demountable rims, allowing one or preferably two exchange rims mounted with tires to be carried on each car. Owing to the tendency of wooden wheels to dry out in hot climates, or in parts of the country where water is not easily obtainable, the writer is in favor of demountable metal wheels, each ambulance carrying one or two exchange wheels fitted with extra tires. These metal wheels are made in three types.

The metallic detachable wheel, the spokes of which are constructed on the principle of those of a bicycle, the wheel itself slipping on over and fastening to a specially grooved hub, which hub in turn is fitted on to the ordinary hub of the chassis. Of all three types of metal wheels, the writer believes this type to be the least suitable for ambulance work. for not only have the spokes a tendency to snap off, but the wheel itself is extremely difficult to clean.

The demountable pressed steel wheel, which, as its name indicates, is constructed of pressed steel, in appearance resembles a wooden wheel. This wheel slips into grooves on the hub of the car, and is held firmly in place by five bolts projecting from a back plate on the hub, the nuts of these bolts being easily removed by the aid of a special bit, the mounting and demounting requiring but a very few minutes. This wheel gives excellent results for single tires.

The third form of metal wheel (also demountable), and that recommended by the writer for this class of service, consists of one piece of thin pressed steel curving outwards and very much resembling a saucer. This is mounted on the hub in much the same manner as the wheel described above, but has the very great advantage over this former of serving for either single or double tires. The double tire effect is obtained by mounting two or these wheels back to back on the same hub, the concave side of the inside wheel being towards the chassis, and that of the outside wheel away from it.

Tires of the dimensions 895 by 135 mm. are, in the opinion of the

writer, the extreme limit in size that can be successfully employed on these medium-powered chassis, without causing too much of a drag on the motor and transmission. If this size of tire is used, it will not be practicable to have double tires on the rear wheels, the section 135 mm. being too large. Instead the dimension 880 by 120 mm. would have to be substituted, this latter dimension fitting the same rim as the 895 by 135 mm. tire. The writer, however, is not in favor of double tires on these medium powered ambulances, considering that they are of advantage only on very heavy and powerful cars or on light trucks.

Electric lighting is practically a necessity for this service, and should be fitted with accumulators "floated" in on the line between the dynamo and the lamps, in order that a steady light may be obtained when the motor is turning slowly or is at rest.

An 18–20 horsepower (European rating) chassis equipped as suggested in the preceding paragraphs of this chapter would weigh in the neighborhood of 1,200 kg. The weight of the ambulance complete and loaded to full capacity, being approximately as follows:

18–20 horsepower chassis (fully equipped)	1,200 kg.
Ambulance body, type Kellner	700 kg.
8 patients at 75 kg	600 kg.
1 driver and 1 aide driver at 75 kg	150 kg.
Total weight with full load, approximately	2,500 kg.

As the maximum speed that a 18–20 horsepower (European rating) car could develop with this load on a level road would be approximately 60 kilometers per hour, it stands to reason that the transmission of the chassis in question must be considerably demultiplied in order that the power plant might meet the demands made upon it. A gear ratio which would give a maximum speed of 60 kilometers per hour when running without patients and only the driver and his aide in the car would be about correct.

For the officers' staff car the most rational arrangement would be to continue the standardization of the section by employing the same type of chassis as that selected for the ambulance, a light four-seated touring body taking the place of the ambulance body, and only two slight modifications to the chassis being desirable. Firstly, the steering column should be sloped to a greater angle. Secondly, the gear ratio should be much higher. The chassis equipped with the light body would be capable of a much greater speed than the heavier ambulances.

For the truck squad, that is to say the kitchen and repair trucks, the large truck for transporting the spare stretchers, equipment and supplies, and the small truck or camionette, the writer is of the opinion that it would be well to standardize this also, using the same power

plant selected for the ambulances, only mounted on a light truck chassis, capable of carrying a load of about 1½ tons; these truck chassis to be equipped with pneumatic tires, single on the front wheels, double on the rear wheels, dimensions 880 by 120 mm. (which size it will be remembered also fits the rims selected for the ambulances). The squad would then consist of five units instead of four, two of these light trucks replacing the heavy truck, and one the camionette. Each one of these units would be quite capable of dragging a light two-wheeled trailer, mounted on pneumatic tires of the same dimensions as those on the trucks themselves. The trailers are intended for bulky but not heavy baggage. These trucks should be geared to a maximum speed of 45 kilometers per hour on the level.

The kitchen and repair truck being naturally immobilized at the quarters of the section, the three other trucks besides performing their real duties of transporting supplies, etc., for the section, could be employed to great advantage for the evacuation of sitting patients whenever there happened to be a great number of these to be moved, each truck having a capacity of at least sixteen persons without overcrowding or a total capacity for the three equal to slightly more than that of six ambulances.

Equipment.—Besides the ordinary equipment of tools, jack, pump, and a few of the more necessary exchange parts, such as spare valves, valve springs, etc., usually carried in all cars, each ambulance should always be provided with two new spark plugs, exchange electric light globes, two *new* exchange tires and four inner tubes in good condition, a set of "Weed chains," a very liberal supply of reserve gasoline and oil and a can of grease, a fire extinguisher, a barn lantern, a canvas bucket, brushes and sponges for washing the car, an electric torch, and two days' full rations for the driver and his aide. The full complement of stretchers should also always be carried. Under no circumstances should any of the equipment of the car, or the personal baggage of the driver and his aide, with the exception of the stretchers, be carried in the ambulance body proper, the interior being always kept in readiness to receive its full load of wounded. All equipment and personal baggage should be stored away in the large cases placed on the running boards for that purpose.

The kitchen truck, as its name implies, is a kitchen pure and simple, the equipment, besides the necessary exchange parts, tires, etc., similar to those of the ambulances, consisting of a stove, cooking utensils, and the mess service of the section. A number of long boards and wooden horses, serving as benches and table for the mess, will be found a great convenience. These, however, would be carried in the supply trucks. Only one other point occurs to the writer in regard to this

unit, and that is that it might be an excellent idea to have the gasoline tank placed on the chassis in such a manner that it could be easily removed, thus lessening the chance of conflagration while cooking is in progress.

The repair truck will naturally carry its extra tires, etc. The remainder of the equipment to consist of a bench, a vise, a portable forge, soldering lamps and irons, a vulcanizer for repairing inner tubes, all necessary tools, a carpenter's outfit, nuts, bolts, wire, etc., and a full list of exchange parts for the cars of the section; the above to be supplemented by a pick, shovel, ax and hatchet, a chain hoist, a tow rope, and several powerful jacks. An excellent idea is to have the equipment include a large piece of canvas tenting the full length of the body of the truck. This can be stretched from the roof of the car to two tent-poles, forming a shelter for the mechanics to work under.

The supply trucks, being intended simply for the transportation of the reserve supplies and camp outfit of the section, or, in case of emergency, the evacuation of sitting patients, will have no equipment other than the spare parts (tires, etc.) similar to those carried by the rest of the cars of the section, excepting that each unit should be provided with four stout boards serving as seats for the patients, the width of the body being sufficient to give a seating capacity of four abreast.

Both the equipment of the personnel and the camp outfit, depending as they do so largely on the nature of the country and the section it is intended to operate in, will be dismissed by the writer with one or two slight observations:

The writer's experience with large tents, capable of sleeping twenty-four men, has not been an extremely fortunate one, for not only are they very heavy, but require a good deal of time and patience to pitch. A greater number of smaller tents is, in his opinion, a more satisfactory solution of this question.

The practice of allowing the personnel of a section to sleep in the ambulances should not be tolerated, disastrous results to their health being only too apt to follow, especially when under the great pressure of a great battle the exhausted condition of the drivers and their aides makes a certain amount of carelessness in disinfecting the cars unavoidable.

The writer hardly believes it necessary to call attention to the fact that every section should be provided with some good disinfecting apparatus, the most convenient of these being in the form of a spray. Extra stretchers and frame for washing such will also be found desirable. The reserve of gasoline should equal the total tank capacity of the section, and of oil in the proportion of one to ten.

EXPERIENCES WITH THE RUSSIAN ARMY OF THE CAUCASUS IN NORTHERN PERSIA

By First Lieutenant T. LYLE HAZLETT
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(With four illustrations)

ALONG one of the old caravan routes of the east, some 200 miles past Mount Ararat, 70 miles from the Julfa, the end of the only railroad leading into Persia, on the desert with the bare desolate Kurdestan Mountains dividing Persia and Turkey, is situated the town of Knoy, which, during the winter of 1915-16, was used as a military base of supplies for the army operating in this region. All supplies were brought up here by camel caravans, ox carts and donkeys, the sand being too deep for automobile transport. It was in this town that the American Field Hospital attached to the Army of the Caucasus was located.

The town was typical of the east, a large wall surrounding it, with its covered bazaars where the natives sat and smoked; along the streets all kinds of filth; the water supply running on the surface in the middle of each street, where you would see the women washing their week's washing; a little farther down the stream, children drinking out of it and women filling their jugs for cooking; and still further it became a sewer for the waste of man and beast. There is little wonder that they had a succession of epidemics in this town.

As this was the military base of operations for all the forces operating within that region, and as there was a continual movement of troops back and forth, it was a military necessity that the town be cleaned up even before troops could be quartered outside the walls. Although it was in the military zone, there still remained a Persian governor who had charge of the town and who was responsible for its police. The population numbered some 20,000 and, besides, there were thousands of Armenian and Syrian refugees constantly passing through; a great many, in indescribable condition, were scattered about the town, without medical attention, food or clothes. The sanitary situation was threatening, so, under the supervision of the sanitary personnel of the army at that point, the governor was compelled to clean up the streets, drain the stagnant pools, which were many, both within the wall and without. Besides there was a large moat encircling the city, and in this moat was dumped all the dead animals and refuse from the town.

In time we were able to have some of the streams in streets covered and the natives began to appreciate that something was being done to improve their living conditions, even if it was happening during a military invasion.

The army hospitals, of which there were two, a military and Red Cross, were situated outside of the wall, in the military quarter of the town. Upon our arrival, in November, 1915, we found that the Red Cross had established a small temporary hospital, four weeks before, in charge of a priest of the Greek Catholic Church, one of those men who have done so much in aiding and taking care of the sick and wounded Russian soldiers in this war, under most distressing condition and without proper supplies. At this time there were about one hundred cases in the one-story mud-brick house, mostly medical cases, as the military field hospital there had been taking care of all the surgical cases. As there had been only one doctor and no nurses, except the orderlies attached to the hospital, to look after these poor men, they were indeed objects of pity. Moreover, it had been impossible for them to receive the proper kind of diet and treatment, and many of them had been on their backs for four and five weeks with typhoid fever. Too much cannot be said of the way the American Red Cross nurses, and also the Russian nurses who had been assigned to us, took charge of these patients, in many instances saving their lives and later seeing them able to return to their families, somewhere in the vast domain of Russia.

The surroundings, as well as the place itself, were most desolate, the great sandy desert stretching out in front and the bald, bleak mountains of Kurdistan in the distance, on both sides. Of course, no one spoke English except within our own hospital; nevertheless, the appreciation and thanks which we continually received from these poor suffering men, who were giving their lives in this great struggle, made us all feel glad that we were able to help a little, even under unpleasant surroundings, in this far-off bleak and desolate country.

The water supply was one of our first considerations, and we discovered we could get fairly good water about a half-mile distant from the hospital; although it was surface water, coming from the mountains, it was reasonably free from sewage contamination from the town. This water we had hauled in barrels and poured into a large hot-water boiler in the corridor of the hospital, where all the drinking water for the hospital personnel and patients was boiled before using, then cooled by putting it in large earthen jugs. Each patient had either a bottle, or his tea kettle, filled with it, at his bedside.

One thing to be said greatly in favor of the Russian soldier, in keeping up his health, is that he never thinks of drinking unboiled water, as the Russian peasant is a tea drinker and each soldier carries his teapot. Whenever the march is stopped, or at the railroad stations throughout Russia, you see the soldiers filling their teapots with boiling water, either for making *chi* (tea) or having the water to drink when it is

cooled. This undoubtedly has been a great factor in the absence of any serious epidemic in the Russian Army, now numbering some 13,000,000 men. In this country it is not safe even to brush your teeth with unboiled water. Among the men assigned to us by the army as hospital corps men were a number of good carpenters and plumbers, so we soon had several small tanks erected for water for the baths, the kitchen and the laundry.

The question of sewage disposal was a difficult one as we had no kerosene, except what was brought across the plains by camel caravans, so disposal by burning was out of the question. Chloride of lime and crude phenol solution were used daily on the excreta, and once every two weeks the receptacles were cleaned out and contents buried. The refuse from the kitchen was burned and the water from the baths and laundry was run into cesspools through drains or ditches, which we were able to make by reason of the great hardness of the ground.

One of our greatest nuisances was the fly, which does not seem to bother the natives in this country, no matter how thick they are. We were unable to procure screens for all the doors and windows, but were able to screen the dining room and kitchen and for the other doors and windows we used gauze, which excluded both the flies and sand, the latter a desideratum in this land of sand storms, which occur nearly every day. The convalescent patients were very willing to kill the flies, especially when we paid them in cigarettes for given quantities.

The hospital building proper was a mud-brick one-story structure, having five wards, an operating room, and several small rooms, which were used for a pharmacy, doctors' quarters and dining room. The building was built for a barracks for the troops, but when needed for a hospital, as there was no other building to be had, it was given over for this purpose. The kitchen was in a separate building, also the nurses' quarters. This arrangement was not as we should have liked, but we were compelled to do with what we had under the circumstances. A large corridor between the wards, together with the yard, served as a receiving room, where each patient was undressed and his clothes sent to the sterilizer; from there he was taken into the bathroom, head clipped, given a hot tub bath and later rubbed with kerosene, for, after having traveled 200 miles, often in two-wheel carts, or on a litter suspended between two horses, over the hot sandy roads, they all were a most distressing sight and covered with vermin.

After these patients were clean and given clean clothing, they were admitted to the isolation ward and kept there for three weeks in order to guard against the possible development of typhus fever. These poor fellows, as soon as they would get into bed, even if the beds were hastily

constructed out of boards—and it had been months since some of them had slept on a mattress—would fall asleep and sleep almost constantly for two or three days, only wakening at meal times; such was their state of exhaustion and fatigue. A great majority of these were medical cases, who were taken sick at the front and sent back for treatment.

The operating room was the only room that had a board floor, the wards were all paved with mud bricks, and the straw from the mud roofs hung down between the rafters and, as it was impossible to get timber, we were forced to keep up continual spraying of the walls and floor with crude phenol solution and kerosene in our fight against vermin.

We had one ward for clean surgical cases, another for pus cases, one for typhoid and dysentery, and another for convalescent medical cases, although at times we were forced to change this division, due to the great number of patients. There were 175 beds in this hospital.

Almost a mile from the town, in an old house formerly used for a harem by one of the Persian princes, was established the typhus hospital. In the ten months we cared for 177 cases of typhus fever, with a mortality of 12 per cent. The nurses and men who cared for these patients lived at the isolation hospital and had their own separate quarters.

At another point, some distance away, was the Turkish prison camp, the medical and sanitary supervision being allotted to us—here we had a large tent hospital which we used in caring for the sick and wounded among the prisoners. This camp was used largely for a quarantine camp, where all the prisoners were kept for at least three weeks. The prisoners after long marches suffered from various ailments, typhus, recurrent fever and malaria being the most common, due largely to the fact of the general condition of patients and change in climate.

In July last we established a cholera hospital, but were fortunate enough not to have any cases among the soldiers; the only cases were among the natives who were acting as transport drivers.

Of the most prevalent diseases, malaria heads the list. In 1,390 medical cases which were admitted to the hospital between November, 1915, and September, 1916, there were 260 cases of malaria, a large number chronic and of the Tertian type. Next followed recurrens fever, 249 cases. We are led to believe that this disease is rarely fatal, but in this series we had some very severe cases, the patients dying with the disease. Of course, some of these were in an exhausted condition before contracting the disease. In the severe cases we used small doses of salvarsan intravenously with very good results, the patients not

Method of Transporting Wounded.

American Hospital at Khoi.

(To face page 448.)

A Camel Transport Used for Bringing Up Red Cross Supplies.

American Red Cross Nurses in Persia.

(To face page 449.)

having another cycle of the disease after its administration. I have never seen any bad effects from salvarsan given in this condition.

The next in frequency came typhus fever. Due to the darkness of the skin of the Arabs and the Turks, it was often hard to make a diagnosis, especially at the beginning. In the fall of 1915, we had mostly all of our typhoid cases, numbering 165. At this time the troops had not all had their prophylaxis against this disease, but in the last six months of our work there I did not see one case of typhoid among the soldiers.

The dysentery which we had was the bacillary form with an occasional case of amebic.

This spring we had forty-nine cases of scurvy which, on account of the impossibility of getting the proper dietary treatment, were often brought to us in the most severe form. We were fortunate enough, about this time, to be able to procure some ripe cherries and, as it was impossible to procure green vegetables, lemons, or oranges, these cherries were the means of saving some of these poor fellows' lives.

The troops in this region all received prophylactic doses of cholera serum and also were given quinine regularly, in all commands.

In summing up the medical work, we were called upon to treat almost every known ailment. In all the medical cases admitted to the hospital there were only three of syphilis and one case of gonorrhea; while in the dispensary, where we treated nearly 2,000 cases, I only saw four cases of gonorrhea and no syphilis among the soldiers. This goes to show how clean and wholesome the Russian peasant is. In the dispensary the two diseases which stood out far beyond anything else among the natives were tuberculosis and trachoma. In our treatment of trachoma nothing was so effective as small narrow strips of sandpaper used instead of a roller. In the surgical cases admitted, there was the usual variety of gunshot wounds, compound and simple fractures, and a large number of frost bites of various degrees. There were twelve cases of hemorrhoids, six of inguinal hernia, two acute appendicitis, and two acute mastoiditis, together with many miscellaneous surgical conditions, which are found with every army in the field. Our death rate for this period was 5 per cent among the soldiers admitted to the hospital.

THE PLACE OF ORTHOPEDIC SURGERY IN THE TREATMENT OF THE WAR CASUALTIES

By Major JOEL E. GOLDTHWAIT
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THE position which orthopedic surgery has been forced to occupy in this war is so conspicuous and so much of the work that is now being developed is bound to be preserved, to meet the civil needs when the war is over, that it is not out of place to consider some of the features which have led to this position and that will demand its permanence.

In the beginning of the war, except for Germany, the nations, in the conservation of their men, conducted their work upon the same lines as had held in all previous wars. Disease was to be prevented in so far as was possible and the treatment of the wounded consisted in the saving of life, with the expectation that discharge from the army with some sort of pension would be the future, if any permanent impairment of function remained. No medical or surgical thought apart from the saving of life was given or considered necessary.

Within a few months, however, it became evident that the mere saving of life unless it was followed by, or associated with, attempts to restore function to the damaged part, represented a burden upon the nation that was so tremendous, and an economic waste that was so great, that the very existence of the nation was jeopardized. Associated with this, the pathetic condition in which most of these young men were placed, with the greater part of their lives to live bound by their physical handicap, was too overwhelming not to make it obvious that something more than mere life saving was called for. In fact it was equally obvious that unless something could be done, it was better, both from the point of view of the man and of the nation, to let him die upon the battlefield. This not only associated his death with the glory and honor which such an end should receive, but it also saved him from the years of physical limitation with the mental and moral deterioration which would otherwise be before him. The saving to the government, also, of such a course is obvious, since the total of expense of maintaining such individuals, after a war of such magnitude, would be so great as to stagger any nation, no matter how firm its credit.

Very early in the war these two facts, the just treatment of the man and the economic stress to the state, became so evident that means were sought for meeting the need.

It was endeavored, at first, to teach those who were crippled some form of occupation that would utilize whatever remaining function might exist. This was taken up first by France and later by England and, while it represented a distinct help, nevertheless that which was still left was so great as to leave very much to be desired. This led to the gradual realization that with proper care the actual crippling could many times be so much relieved that life could be lived upon a much more normal basis, and that this, together with the special training for industry, often sent the man back into civil life actually able to fill higher positions of usefulness than had been occupied before.

For such work, naturally, men who were trained to think of results in terms of function were needed, and it was here that the orthopedist found his opportunity. The problems involved, while presenting many new features, demanded, nevertheless, the same general principles of treatment that were required for the conditions of civil life. The chief difference, of course, was in the aetiology, in that trauma was practically always the cause of the disability, while in civil life this was only one of the causes of the crippling conditions which the orthopedist was expected to meet.

In England, where this work has received as much attention as in any of the countries, the work has been directed by Col. Sir Robert Jones, who in March of 1916 was formally appointed inspector of military orthopedics.

Under his guidance not only has the work been most broadly developed, but the justification for the creation of the position, and the selection of the man to fill it, is clearly shown by the results which are so striking that the nation has honored him by giving him the military rank of colonel at the same time that knighthood and admission as Companion of the Order of the Bath were conferred.

Classification.—Following the creation of the office of inspector, an official classification was prepared of the conditions that were to be considered orthopedic and is as follows:

(*a*) Derangements and disabilities of joints, simple and grave, including anchylosis. (*b*) Deformities and disabilities of feet, such as hallux valgus, hallux rigidus, hammer toes, metatarsalgia, painful heels, flat and claw feet. (*c*) Malunited and ununited fractures. (*d*) Injuries to ligaments, muscles, and tendons. (*e*) Cases requiring tendon transplantation or other treatment for irreparable destruction of nerves. (*f*) Nerve injuries complicated by fractures or stiffness of joint. (*g*) Cases requiring surgical appliances.

The magnitude of the problem which such a classification imposes is shown by the fact that in all of the estimates of the percentages of the

injuries requiring special orthopedic treatment, that it has been possible for me to obtain, none have been less than 30 per cent, while some have been as high as 50 per cent. When it is realized that in the British Isles there are several hundred thousand military hospital beds, apart from the great number for the British forces in France, the importance of the position of the inspector of military orthopedic can be appreciated. This, of course, is entirely apart from the beds provided for this type of cases in Canada and Australia.

The responsibility of the position has been still further increased by the fact that, while not in the original classification, nevertheless the problem of handling of the limbless has more and more been turned over to the orthopedic department. Even in the early institutions for this work, notably Roehampton House where between seven and eight thousand artificial limbs have been fitted, while under independent organization, the work was more or less directed by orthopedic surgeons. At Roehampton House, Dr. Muirhead Little is the Medical Director.

Orthopedic Organization.—Special hospitals have been developed or parts of general hospitals have been taken and the service expanded as fast as men could be obtained to officer them.

At first the support of the government was offered grudgingly, but as time has gone on and the character of the work has been appreciated the support has become more and more cordial, until at present the pressure being made by the government, for expansion of the service, is embarrassing to the inspector, owing to the difficulty of finding properly trained men to officer them. It was these circumstances that made the arrival of the American orthopedic unit most opportune.

In the different orthopedic centers one or more of the Americans are stationed.

Two of the centers have less than 500 beds, but all of the others have that number or over, the largest having 1,100 beds entirely apart from the so-called auxiliary hospitals in which the convalescent or outpatient cases are housed.

At present there are many thousand purely orthopedic beds under the direction of the inspector, but it is appreciated that at least six times the present number is required if the need is to be fully met, and that there will be a rapid expansion of the service there is no question. Already other large centers are planned, with also special hospitals for the limbless.

The great difficulty in such an expansion is, of course, the securing of properly trained men for the staff, since so much is expected from the orthopedic department that only men who are thoroughly trained can be considered and, even with these, the men must be willing to serve

reasonable periods of observation and instruction before they can be considered competent to meet the needs presented by these special injuries.

The hospitals are not only fully equipped to meet the surgical need with operating room, X-ray service, etc., but also have well-equipped departments for electrotherapy, hydrotherapy, massage, special exercises, both passive and active, including special gymnasia. Besides these, and of quite as much, if not more, value from a purely therapeutic point of view, there are in all of the centers the so-called curative workshops. In these the patients not only find occupation to lessen the monotony of the long periods required for the treatment, but in the performance of the work, if the special occupation is selected with proper care, distinct benefit to the affected part is obtained.

Curative Workshop.—In the development of these shops there are two distinct features recognized. One is to furnish occupation during the frequently long and monotonous period for the healing. The effect of such work is partly to stimulate the circulation and general tone of the affected part but it is also of much value psychically, in that the general interest in the work keeps the patient in a better mental state with corresponding improvement in the general physiology. For this use of the shop the occupation can be chosen largely with reference to the fancy of the patient and may be planned with reference to later on carrying it to the learning of a special craft or trade. In this type of shop a variety of industries should be developed and the most common are carpentry metal work, including forge and brace work, leather work, coarse and fine, cobbling, tailoring, net making, basket making and draughting. The product of such shops may have commercial value and many of the splints or braces that are used in the hospitals are made in this way, as well as much of the shoe and clothing repairing and some of the special furniture. As reward to the patients for their work, special privileges are allowed, and they are made to realize the value to them of the work from a therapeutic point of view, as well as the future value to them from an industrial point of view.

The other use of the curative workshop is purely physical at first and is prescribed as one would prescribe massage or electricity. The occupation is chosen and the special part of the given occupation is chosen, with reference to the particular need of the individual. For instance, if the wrist is stiff and the circulation in the hand is poor, the use of a carpenter's plane will necessitate the use of the fingers as well as the use of the wrist. At first the stroke may of necessity be very short, but this should gradually be lengthened until it starts well back of the vertical line of the body and is carried well forward. If

pronation and supination are limited, after the above movement is accomplished, the plane should be tipped on to the side and the edge of the board treated. This uses the muscles entirely differently and with such work, if guided rightly, the part is brought into good function with practically no discomfort to the individual.

The same principle can be used for the elbow by the use of a short-bladed saw, the length of the blade or the length of the stroke being increased as the motion in the elbow increases. At other times the use of the gimlet, screwdriver, augur or bit and bit stock, will be most helpful in establishing other functions of hand and arm. For the feet or legs the jig saw or machines in which the legs are used are most important. With a shop for this special purpose it is not necessary to have great diversity of trade, one or two being all that is required, and carpentry has the greatest value because of the great range of possibility in the selection of the special task or the special tool. In such a shop the material output should not be considered, the health of the individual being the only product of importance, but it is of course obvious that after a certain period the patient can be transferred from this special shop to the first and more general type, where less careful supervision is needed and where the choice of the individual in the selection of the work can be considered.

Type of Cases.—Of the cases that are admitted to these special hospitals there are, of course, many bone injuries requiring all of the most modern resources to bring about repair; many stiffened joints to be made flexible or put into position for useful function; many lacerations of muscles and tendons, but perhaps the feature for which the orthopedist has been the least prepared is the large number of nerve lesions in connection with the bone or joint injury. This latter feature has made necessary the performance of a great many operations for the reuniting of ends of the severed nerve, with the direction of the long after treatment required for the return of the nerve functions.

The decision as to the best time for the operation, in any of the conditions, is one requiring much experience, since in the surgery of this war it has been found that the special organisms causing the infection are many times latent and capable of being rendered active, many months after the wound has healed. For this reason, before operation, massage of the scar or gentle manipulations should be practiced to see if any reaction follows. Also at the time of the operation the old scar should be carefully dissected away in the hope thereby of still further lessening the danger of lighting up the old process. When it is realized that the tetanus bacillus as well as the gas bacillus has virulently started up in the wounds healed for six, eight and ten months, the use of these

precautions is obvious as well as the regular use of the anti-tetanic serum before all operations.

Limbless.—For the part that the orthopedic surgeon has to play with this condition, the first involves getting the stump ready for the artificial member, and the other the seeing that the adjustment of this new member is satisfactory. For the first, it must be remembered that in order to make the use of an artificial limb satisfactory the joint above the amputation should have the normal range of motion, a fact which rarely exists as the patients are commonly turned over to the artificial limb-makers. The thigh is commonly flexed at the hip and adducted in the amputations above the knee. For those performed below, the knee is usually flexed and complete extension is impossible, a similar condition as exists at the elbow with amputations of the forearm. For amputations of the upper arm the stump is usually flexed forward and drawn toward the body.

In none of these positions can it be expected that an artificial limb can be successfully applied, and obviously the first step consists in treating the stump by massage, exercises or splinting until the full range of motion in the special joint is obtained. At the same time if the fleshy stump is adherent to the bone or a large scar exists, it should be treated by massage or operation, so that a suitable bearing surface for the artificial member is provided.

Results.—It is of course impossible to give an adequate idea of the results being obtained in these large orthopedic centers, but a suggestive idea can be obtained from the figures taken from the records of the early months of the work at one great hospital. Of 1,350 patients discharged in a given period, about a thousand were sent back into the army as Class, A, Class B, or Class C men, and of this number 294 were Class A men. The remaining 350 cases were sent back into civil life better and industrially trained so that although crippled, they were still of use to themselves and the community. When it is realized that all of those cases would ordinarily have been discharged from the army as hopeless pensioners, the significance of the results is obvious and one is not surprised that the nation is demanding more and yet more of this kind of work.

Conclusions.—These are a few of the impressions that have been made upon me in the study of the problem as it is confronting our nation, but no one can see the work and realize that the existence of it is to insure to the men, not the mere saving of life or the mere healing of wounds, but the restoration of useful function in the damaged part, without being conscious that the same needs exist today in the injuries of civil life. With the vivid object lesson which this military orthopedic

work has made, it is easy to believe that the same insistance upon the restoration of the function with the civil accident will be made with the necessary readjustment of our institutions to meet this need. It will be, not how soon can the patient be "gotten out" but how long must this patient be kept, in order to secure his return to industry "fit" instead of crippled.

This has been so strikingly suggested in England that already plans are under way that involve the taking over of several of the largest of the orthopedic centers after the war is over for the continuance and permanent development of the work.

That there is the same need with us no one who has studied the situation at all, or who is conscious of the inadequacy of our present hospital methods to meet this need, can for a moment question, and it is quite obvious that after the war is over we shall turn, as England is already turning, to the permanent fully-equipped orthopedic center, run upon the broadest lines, for the saving of the many men who are being crippled by industry or disease.

In preparation for this, the training which the orthopedic men of our country are receiving in the orthopedic centers of England will be of inestimable value, as well as making them ready for the more immediate probable need of caring for our own wounded soldiers.

RIGHT OF THE SOLDIER TO REFUSE AN OPERATION

Norrlin discusses the conditions and regulations in this respect in Germany and Austria, studying them from both the medico-legal and the military standpoints. The question is important not only for military but for civilian circles and from the standpoint of both sociology and national economics. By persuasion and reasoning it is generally possible to obtain the consent for a needed operation, but if not, there may be conditions, he thinks, in which it is deemed best to perform the operation despite the patient's refusal to consent. There has been considerable literature published on the subject in the last year or two. Von Eiselsberg denounces as an infringement on personal liberty any attempt to compel a man to submit to an operation against his will. Others, on the contrary, insist that the wonderful success of the war surgery of the day should justify the military authorities in relieving the wounded of the decision as to whether they are to be operated on or not. Norrlin regards the obstinate refusal to permit a rational corrective operation as on a par with self-mutilation to avoid military service or to secure an indemnity.—*Hygiea*, Stockholm, May 71.

THE STATISTICAL LESSONS OF THE CRIMEAN WAR

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IN HIS Seaman prize essay of 1914, Maj. Louis C. Duncan made a careful study of the comparative mortality from disease and from battle casualties in the historic wars of the world.[1] It is shown that the relation between battle losses and losses from disease is variable and not of importance in itself. The main thing about either is to ascertain the avoidable causes of heavy loss, if possible. When battle losses (killed in action) are high, they are unavoidable, at least as far as the medical establishments of armies are concerned. The avoidance of these losses is the affair of the line. But when losses from diseases and wounds are high, they are usually due to infectious diseases which it is the duty of the medical establishment to prevent. Duncan's diagrams of losses by disease in war show the fluctuating influences of epidemic conditions with bad or indifferent sanitation down to the present time. In the past there were varying battle losses with almost inevitably high losses from disease. In the present European war there have been for the most part heavy battle losses and a minimum of infection or losses from it. The Crimean War (1854–6) had the highest losses from battle per thousand (among the Russians) and from disease (among the French) of all historic wars. The statistical lessons of this war are therefore of the greatest interest, for, as Munson states, statistics of sickness and mortality in the British army were "first compiled shortly after the close of the Peninsular War" (1808–14),[2] and, before that time, were based on rough estimates, usually too large.

Dr. Samuel Johnson, whose ruling principle was "Clear your mind of cant," summed up the status of the earlier military statistics in a single sturdy paragraph:

> The religion of the north was military; if they could not find enemies, it was their duty to make them: they traveled in quest of danger, and willingly took the chance of empire or death. If their troops were numerous, the countries from which they were collected are of vast extent, and without much exuberance of people great armies may be raised where every man is a soldier. But their true numbers were never known. Those who were conquered by them are their historians, and shame may have excited them to say that they were overwhelmed with multitudes. To count is a modern practice; the ancient method was to guess; and when numbers are guessed, they are always magnified.[3]

The origin of vital statistics or the census of a definite population was military necessity. In order to find the fighting strength of a nation it

[1] Duncan: *Jour. Mil. Service Inst.*, Governor's Island, N. Y. Harbor, 1914, liv, 141–177.
[2] Munson: *Ref. Handbook Med. Sc.* (Stedman), New York, 1913, i, 593.
[3] Johnson: A Journey to the Western Islands of Scotland (1774), New York, 1886, 116.

was necessary to count its people. This was true of the census of the Israelites at the Exodus, of that carried out by Joab at the instance of David, of China, Persia, and particularly of the cinquennial census of the Roman population, and the lustration of Roman troops before and after a campaign or battle. Even after the long night of the Middle Ages, when quantitative methods fell into disuse, "bills of mortality" originated in seventeenth century England and Germany ("Breslau tables") from concern about the slow growth of the population in consequence of the lengthy wars and devastating epidemics of the past.[4] In 1693, Edmund Halley, the English astronomer, in his Royal Society report on the Breslau tables of mortality, said explicitly: "The first use hereof is to shew the proportion of *Men* able to bear *Arms* in any multitude . . . so that the whole Force this City can raise of *Fencible Men*, as the *Scotch* call them, is about 9000."[5] The initial and fundamental problem was, in the old Scots phrase: Find the number of fencibles.[6]

The Crimean War was fought in a circumscribed area, far distant from the centers of authority and supplies of the Western allies. In the midst of the campaign, they found themselves hampered by conflict of opinion between the commanders of their field forces and their central governmental administrations. Sanitary service was subordinated and neglected, until the hardships of winter (1854–5) and severe outbreaks of epidemic diseases created the necessity for reorganization to right the condition, in the British Army at least. This war was an object lesson in military medicine, but the lesson was seldom heeded, in spite of the fact that few wars have been so well described and so exhaustively studied. With the work of the clinician Louis in medical statistics (1835) and of William Farr in vital statistics (1839–85), more insight was gained into the significance of tabulated data, but the publication of army medical statistics was discontinued in the English establishment at the outbreak of the war and not resumed until 1859 (Munson). In 1858 the Army Medical Department of Great Britain published a "Medical and Surgical History" of the operations of the British Army in the Crimean War. Similar reports were rendered for France by J. C. Chenu (1865) and for Russia by C. von Hübbenet (1871). Chenu, who had to work single-handed, was reviled by Kinglake as a "distracted compiler," but

[4] See the opening chapter of Froude's History of England.

[5] Halley (Phil. Tr., London, 1693, xvii, 579, *et seq.*): reprinted in *Jour. Inst. Actuaries*, London, 1873–5, xviii, 254.

[6] The whole history of statistics is full of color and interest. We can only adumbrate the basic military element. Modern physicians of advanced type, like Billings or Osler, have repeatedly instanced the numerical data of armies as norms for medical records. As Osler puts it, the clientèle of medical officers has "more stability, a less extended range of variation than that with which we deal in civil life," so that military records serve physicians "as a standard of comparison, as a sort of abscissa or base line." Billings began his statistical studies in his pocket note-books of battle losses in the Civil War. The *London Times* stated recently that the vital and medical statistics of the U. S. Census, before Billings took them in hand, were "worse than worthless," yet as Capt. John S. Fulton tells us it was always Billings who insisted that even the most recent of these census reports did not indicate the true mortality rates, but only the defective character of the enumerator's returns. Such return, are apt to be, in Fulton's phrase, of the "compound, comminuted" variety.

Sir Thomas Longmore has shown that Kinglake confused the number of admissions into hospital with the number of patients admitted; the former may in time even exceed the fighting forces, the latter never.[7] At the close of the war, Guthrie, the famous army surgeon of Waterloo, himself drew up a scheme for medical reorganization of the British Army (1855).

In 1854 some 10,000 French soldiers were landed at Gallipoli. During the whole period of the war, France had 309,268 men in the Crimea, the last of whom were not removed until July 6, 1856. Of these, 550 were army surgeons, about 450 in the field in December, 1855, or one physician to every 322 men. Most of these were regimental surgeons. At the beginning of the war there were only 40 hospital surgeons for ambulance and hospital service in campaign; by June, 1854, this number was increased to 114; at the end of August, 1855, the number of ambulance surgeons was 86.

The medical officers were completely subordinated to the *intendance*, or direct administration, and had no authority beyond that of ordinary civil practitioners at the bedside. Even the control of hospitals, ambulances and medical service in battle was directed by the *intendance*.

Every division of infantry had a division ambulance of five line officers, six surgeons, three apothecaries, twenty privates or male nurses, and eventually one instrument-maker with an assistant. In battle, this ambulance divided itself into a flying ambulance (one officer, one surgeon, five nurses), posting itself in a covered place near the firing line, carrying its material in a wagon or on horseback, and evacuating its wounded, after first aid, to an ambulance depot (one officer, five surgeons, twelve nurses from above personnel). Each division ambulance had eighteen tents, and was supplemented by a corps ambulance as a reserve and as an intermediate station between the ambulance depot and stationary hospitals in the interior. The ambulance personnel was later supplemented by details of enlisted men and a corps of assistant nurses (2,000 in 1855). This untrained force was of little use, and female nurses were only admitted to hospitals in Constantinople.

England sent a total of 97,864 to the Crimea (14,000 in April, 1854; 56,000 in April, 1856), of whom 448 were surgeons, 266 in 1854, 415 in 1855, or one surgeon to every 135 men. Each regiment of English infantry had one surgeon and three assistant surgeons, who looked after its entire medical service in regimental hospitals. The matériel, for each regiment, consisted of a pack-animal, with instruments, bandages and medicines, and ten litters. For every division, there was a "brigade of hospital corregence" and these had in all forty ambulance

[7] Longmore: The Sanitary Contrasts of the British and French Armies during the Crimean War. London, 1883, p. 15, footnote. The fact that the same man may be temporarily admitted to hospital several times swells the final returns, like the "repeaters" in fraudulent elections.

wagons, twenty of which were two-wheeled, and two-horsed, twenty four-wheeled and four-horsed, the latter holding four litter-beds each, with chests of instruments and surgical matériel. On the roof of the wagon six patients could be seated, protected by a covering against rain and sun. There were also fourteen wagons for requisitions. The terrain proved so bad eventually that the sick had to be transported on horseback, as with the French. A corps of military nurses was also commandeered from the line or the civilians (12 to 78 men per company in June, 1855, 10 to 120 men per company in September, 1855). These were of little value, and effective aid was first rendered by Miss Nightingale, who brought over thirty-seven nurses in November, 1854, to be followed by fifty under Miss Stanley in 1855. Their achievement is a matter of history.

In 1854, the Russians had 51,000 men in the Crimea, 30,000 to hold Sebastopol, the rest as an observation corps in the southeastern part of the peninsula. The forces were subsequently increased to 200,000 men. As the Russians were unprepared for invasion, sanitary arrangements at the outbreak of the war were on a peace footing. The whole Russian army had only 1,608 surgeons. An attempt was made to bring the medical establishment up to a war footing by enlisting the aid of civilian physicians, of whom 188 responded; by securing 114 volunteer physicians from Germany and America, mostly inexperienced young men, ignorant of Russian and further handicapped by unpopularity, since their pay was twice or four times the stipend of the Russians; by commandeering 164 physicians from other ministries and 7,000 medical students. Of this variegated assembly, most were useless and many were incapacitated by the hardships of the campaign and its diseases. No fewer than 354 Russian physicians died in the Crimean campaign. The naval surgeons of the Russian fleet, some vessels of which had been sunk, might have rendered valuable aid to the land forces, but were neither authorized nor directed to do so. Hospital corps work was eked out by the so-called Feldshers, of whom 2,270 with 1,489 Feldsher pupils were eventually employed, 3,759 in all, but 1,664 of these were lost by death and disease, so that convalescents in hospital, military bandsmen, naval prisoners and enlisted men from the line had to be detailed as male nurses. Real medical aid came from two unexpected quarters. During the siege of Sebastopol, the two greatest military surgeons of Russia, Pirogoff of Petrograd and Hübbenet of Kief, volunteered to assist and hurried to the front with a corps of trained assistants and pupils. Pirogoff was on duty from November, 1854 to June, 1855, and upon his arrival, 300 trained nurses, sisters of the Society of the Elevation of the Cross (Petrograd), under the patronage of Grandduchess Helena Pavlovna, were sent to Sebastopol to work under his direction. Another contingent of sisters, from a

charitable society patronized by the Czarina, was active in the hospitals outside of Sebastopol. These sister-nurses rendered most efficient aid.

Each Russian regiment had a regimental staff surgeon commanding the battalion surgeons, apothecaries, feldshers, and hospital attendants. These staff surgeons were subordinated to the regimental commanders and medical staff administration. For reception of light cases of illness (*okolotki*), there were regimental hospitals, supported by subscription from the troops, with a capacity of 84 to 112 for infantry regiments, 46 to 56 for cavalry, 5 to 8 for a battery of artillery. Apart from the Naval Hospital at Sebastopol (500 beds) and the City Hospital at Simpherol (100 beds), there were only five military hospitals, viz., those at Sebastopol (610 beds), Simpherol (310 beds), Theodosia (310 beds), Kertsh-Jenikale (160 beds), and Perekop (60 beds)—in all 2,050 beds. There were no movable field hospitals until February, 1855, when four of 250 beds were organized. Supreme authority was in the hands of the line officers; there was no surgeon general until the siege of Sebastopol, when the medical administration was given to a division surgeon. Later, a General Staff Surgeon and a General Director of Hospitals were appointed. The fleet in the harbor possessed a medical inspector whose activities were limited to the Navy.

The Sardinian contingent had 17,000 men in the Crimea, eventually 21,000 men, with a sanitary personnel of 88 surgeons, 176 male nurses, and 20 sisters; also ambulances and a field hospital.

The Turks had 12,000, eventually 35,000 men, with no sanitary organization whatever. Beyond the attention of a few native and foreign physicians, the sick and wounded were crowded together in various places and left to their fate.[8]

The Crimean war lasted from September 14, 1854, until July 12, 1856, and was mainly concentrated on the siege of Sebastopol, the sally-port of the Russian fleet. The Battle of the Alma and the actions at Balaklava and Inkerman led to the deadlock caused by the winter of 1854–5 and the differences between Napoleon III and the generals in the field as to the conduct of the war. The establishment of telegraphic communication between France, England and the Crimea imposed a dreadful incubus upon those in actual contact with the enemy. London and Paris burned the wires with strange administrative orders which hampered their respective armies and incidentally blighted the French medical service very materially. Canrobert resigned to serve faithfully in a subordinate position; his successor Pelissier was reduced to impotent fury and Lord Raglan died of worry. The assault on the Malakoff and the capture of Sebastopol virtually terminated the war. The Crimean War

[8] These details from P. Myrdacz: *Sanitats-Geschichte des Krim-Krieges*, 1854–56, Vienna, 1895, 2–9.

was not only one of the bloodiest of modern wars, but also one in which the death rate from disease was extraordinarily high. In the earlier operations, cholera played havoc among the French troops. The statistics of the successive battles of the Crimean invasion are as follows:

Battle	Date	English				French			
		Killed	Wounded	Missing	Total	Killed	Wounded	Missing	Total
Alma	Sept. 21, 1854	348	1,622	....	1,970	141	1,197	3	1,341
Sebastopol	Oct. 17	....	....	....	260	25	179	.....	664
Balaklava	Oct. 25	....	....	....	1,000	.....	.....	.....	.....
Inkerman	Nov. 25, 1855	634	1,885	63	2,582	289	1,437	70	1,796
Sebastopol	April 9–19	....	....	....	205	.....	.....	.....	1,585
Sebastopol	May 1–3	....	....	....	.....	227	1,058	.....	1,285
Sebastopol	May 22	....	....	....	.....	.....	.....	.....	2,279
White Works	June 6	....	....	....	693	697	4,363	303	5,363
Sebastopol	June 18	....	....	....	1,728	1,370	1,765	411	3,546
Tschermann	Aug. 18	....	....	....	100	291	1,227	.....	1,518
Malakoff	Sept. 10	385	1,910	176	2,471	1,364	4,783	1,416	7,833

Battle	Date	Russian			
		Killed	Wounded	Missing	Total
Alma	Sept. 21, 1854	1807	2821	1008	5,636
Sebastopol	Oct. 17	.....	.....	.....	5,709
Balaklava	Oct. 25	238	312	.....	650
Inkerman	Nov. 25, 1855	2,988	6,151	1,590	10,729
Sebastopol	April 9–19	.....	.....	.....	7,378
Sebastopol	May 1–3	294	.....	1,200	1,494
Sebastopol	May 22	.....	.....	.....	3,061
White Works	June 6	.....	.....	.....	6,000
Sebastopol	June 18	783	4,979	.....	5,762
Tschermann	Aug. 18	3,320	6,614	.....	9,934
Malakoff	Sept. 10	2,972	8,066	1,875	12,913

Total losses of allies in these battles (including 300 Piedmontese), 38,519.
Total Russian losses, 68,266.

The fragmentary character of the above returns illustrates the difficulty in obtaining reliable statistics from the front when pitched and desperate battles are going on in rapid succession. In such a mélée as Balaklava, for instance, there was no time to gather figures. The Turks kept no statistical records of their losses whatever. One account of the battle of the Alma gives the total French losses as 1,346, the English as 2,965 (4,329 in all), the Russian as 5,709 (1,892 killed, 3,172 wounded, 735

missing). In May, 1855, there were 174,000 of the allied troops (32,000 British) and 170,000 Russians. The allies lost in all 70,000 men, the Russians 128,700. During the entire siege of Sebastopol the Russians lost 102,670 dead, wounded and missing, according to Berndt, who also states that the total losses in the Crimea from all causes and in all theaters of war were 252,600 of the allies (45,000 British) and 256,000 of the Russians. Mulhall gives much larger figures. Myrdacz[9] gives the following tabulation of the total mortality from wounds and diseases in the allied armies.

Army	War strength	Killed	Wounded	Died of wounds	Sick	Died of sickness	Missing, etc.	Total losses from all causes
French (April, 1854— June, 1856)	309,268	8,250	39,868	4,354	196,430	49,815	7,752	70,071
English (April, 1854— June, 1856)	97,864	2,755	18,283	1,847	144,390	17,225	345	22,172
Piedmontese (May, 1855— June, 1856)	21,000	12	167	16	21,896	2,166	.....	2,194
Total Allies	438,132	11,017	58,318	6,217	362,716	69,206	8,097	94,537
Russian (September, 1854 —October, 1855)	324,478	21,000	92,381	14,671	322,097	37,454	2,288	73,125

or, by comparison per 1000—

Army	In every 1,000 there were						Died per 1,000 of		Ratio of killed and wounded to died of disease
	Killed	Wounded	Sick	Died of wounds	Died of diseases	Missing etc.	Wounded	Diseased	
French	26.6	128.9	635.1	14.1	161.1	226.5	109.2	253.5	1 : 3.9
English	28.2	186.8	1,475.4	18.9	176	227.5	101	119.3	1 : 3.7
Piedmontese	0.6	7.9	1,042.7	0.8	103.1	104.5	95.8	98.9	1 : 77.3
Allies	25.7	136.2	847.2	14.5	161.6	220.8	106.6	190.7	1 : 4
Russians	64.7	284.7	715.3	45.2	115.4	225.3	158.8	161.3	1 : 1.05

There were fully twice as many killed and wounded among the besieged Russians as among the Allies. Among the Allies, every fortieth

[9] Myrdacz: *Op. cit.*, 53.

man was killed, every seventh man wounded; among the Russians every fifteenth man was killed, every third to fourth man wounded.

The English statistics of disease include the patients in regimental hospitals, those of the French exclude cases in the regimental infirmaries; the Russian omit the light transient cases (*okolotki*). The English and French losses cover twenty-seven months (April, 1854, to June, 1856), the Piedmontese fourteen months (May, 1855, to June, 1856), the Russian thirteen months (September, 1854, to October, 1855). Hence the Russian losses, while not directly comparable, would indicate a much greater total loss than those of the Allies. The number of Russian deaths from wounds was three times greater than that of the Allies. Of the Russians, every ninth man of the forces died of disease; of the Allies, every sixth man. The French sustained the highest mortality in relation to the actual number of their sick, *i. e.*, 253.5 out of every 1,000 patients (or every fourth patient) died. With the exception of the Piedmontese, the total losses (dead, wounded and missing) per 1,000 were about the same, *i. e.*, 225.3 of the Russians, 226.5 of the French, 227.5 of the English; but the fragmentary statistics of the Russians would tend to make their losses per 1,000 much greater. The ratio of "died from wounds" to "died from disease" was as 1:4 among the allies and 1:1 among the Russians.

Of special diseases, cholera attacked the British and the French forces in two successive epidemics, viz., from June, 1854, to February, 1855, and from April to June, 1855, with a gradual period of decline in the latter outbreak down to March, 1856. Among the British, the first epidemic began in June, 1854, with 3 cases, reached a maximum of 1,232 cases in September and subsided to 11 cases in February, 1855. There were 4,883 cases in all, with a mortality of 2,902. The second epidemic began with 7 cases in April, 1855, 1,128 in June, subsiding to 7 cases in February, 1856. The number of cases in all was 2,692, the mortality 1,611. Among the French, the first epidemic began with 8 cases (June, 1854) at Varna; in July, during the Dobrujda expedition, there were 8,239 cases, in August, 3,043, in September, 376, in October, 820, and 11 in March, 1855. There were 13,900 cases in all, with a mortality of 6,708. The second epidemic began in May, 1855, with 512 cases, 4,762 in June, subsiding to disappear by December. There were 8,780 cases in all, with 3,336 mortality. During May-August, 1855, the Piedmontese had 2,788 cases with 1,830 deaths in an army of 21,000 men. At the siege of Sebastopol (May to October, 1856) there were 8,136 cases with 3,557 deaths. The mortality per 1,000 was 544 among the French, 596 among the English, 656 among the Piedmontese, and 437 among the

Russians. Of typhus fever, the French had 9,893 cases with 4,308 deaths, the English 82 cases with 285 deaths, the Piedmontese 647 cases with 184 deaths. The morbidity and mortality per 1,000 were—

Army	Morbidity	Mortality
French	32	13.9
English	8.4	2.9
Piedmontese	30.8	8.8

The French had 23,254 cases of scurvy, with 641 deaths; the English 2,096 cases with 178 deaths; the Piedmontese, 901 cases, with twelve deaths. The English had 7,882 cases of dysentery, with 2,143 deaths.[10]

In 1857, R. T. Jopling made a statistical study of the mortality of British officers in the four principal battles of the Crimean War.[11] He gives the following tabulation of mortality of officers in the actions at the Alma, Balaklava, Inkerman and Sebastopol, the latter including all wounds incurred in the incidental attacks and the continued trench warfare:

Rank	Alma		Balaklava		Inkerman		Sebastopol		Total		
	Killed in action	Died of wounds	Killed in action	Died of wounds	Killed in action	Died of wounds	Killed in action	Died of wounds	Killed in action	Died of wounds	Both causes
Major General	....	....	....	....	1	2	1	....	2	2	4
Colonel	....	....	....	....	1	....	3	1	4	1	5
Lieutenant Colonel	1	....	....	1	8	3	6	2	15	6	21
Major	2	....	1	....	2	1	6	4	11	5	16
Captain	8	2	6	1	14	1	34	11	62	15	77
Lieutenant	9	3	3	....	15	3	33	22	60	28	88
Ensign and Cornet	3	1	1	....	2	1	1	2	7	4	11
Quartermaster	....	....	....	....	....	....	....	1	....	1	1
Surgeon	....	....	....	....	....	....	1	....	1	....	1
Total	23	6	11	2	43	11	85	43	162	62	224

Of the total 224 officers killed in action and died from wounds, 46 were field officers, 77 captains and 101 subalterns.

[10] Myrdacz: *Op. cit.*, 55–56.
[11] Jopling: *Jour. Statist. Soc.*, London, 1857, ix, 54–60.

The proportion of the mortality of officers to the total number of officers exposed to risk is shown in the following table:

Battles	Number exposed to risk	Number killed	Being one in	Number killed and died subsequently from wounds	Being one in
Alma	1,065	23	46.3	29	36.7
Balaklava	1,146	11	104.4	13	88.2
Inkerman	1,115	43	25.9	54	20.7
Sebastopol	3,250	85	38.8	128	25.2
Crimea	3,250	162	20.0	224	14.5

In this table the number of officers estimated is exclusive of those attached to foreign legions, the artillery, engineers and Land Transport Corps. The ratio of killed in action to the total number exposed was 1 : 20 (5 per cent) and of killed and died from wounds 1 : 14.5 (nearly 7 per cent). For comparative purposes Jopling gives the following table of relative mortality of British officers at Waterloo and the battles of the Peninsular War:

Battles	Number exposed to risk	Number killed	Being one in
Waterloo	2,295	186	12.3
Talavera	1,034	45	23.0
Salamanca	2,318	48	48.3
Vittoria	2,574	44	58.5

The mortality of British officers from disease in the Crimean War, by rank, is shown in the following table:

Rank	Number of deaths from disease	Rank	Number of deaths from disease
Field marshal	1	Ensign and cornet	5
Major general	2	Quartermaster	12
Colonel	2	Paymaster	9
Lieutenant colonel	9	Surgeon	5
Major	14	Assistant surgeon	13
Captain	30	Veterinary surgeon	4
Lieutenant	49		
		Total	148

Exclusive of officers attached to special service, 28 field officers, 30 captains and 90 subalterns died of disease: Total, 148, or 4.5 per cent (1 in 22) of the total number exposed to risk (3,250). The total mortality of British officers from wounds and disease was 372, or 74 field officers, 107 captains and 191 subalterns. Thus, of 3,250 officers sent out, 5 per cent were killed in action, 2 per cent died of wounds, 4.5 per cent died from disease, or a total of 11.5 per cent (nearly one in nine).

In 1858 Assistant Surgeon Richard H. Coolidge, U. S. Army, made a comparative study of the mortality and sickness of the British Army in the Crimean War as compared with that of the United States Army in the War with Mexico.[12] As the British were exposed to cholera, typhus and the rigors of the Crimean winter, so the American troops suffered from fevers, Mexican diarrhea and the intense heat of the Rio Grande and Vera Cruz. The following table shows the comparative relations of mortality and wounds in the British and American armies.

Forces	Total strength officers and men	Total period of service in months	Killed in battle			Died of wounds		
			Officers	Men	Total	Officers	Men	Total
British Army:								
Regulars	97,864	25	157	2,598	2,755	86	1,933	2,019
United States Army:								
Regulars	15,736	26	41	422	463	22	307	329
Additional force	11,186	15	5	62	67	5	71	76
Volunteers	73,260	10	46	467	513	0	100	100

Forces	Total killed and died of wounds			Wounded in battle		
	Officers	Men	Total	Officers	Men	Total
British Army:						
Regulars	243	4,531	4,774	515	11,361	11,876
United States Army:						
Regulars	63	729	792	118	1,685	1,803
Additional force	10	133	143	36	236	272
Volunteers	46	567	613	129	1,189	1,318

The following shows the losses in both armies from disease or accidental causes:

[12] Coolidge: *Am. Jour. Med. Sc.*, Phila., 1858, N. S., xxxv, 86–94.

Forces	Total strength, officers and men	Period of service in months	Ordinary and accidental deaths		
			Officers	Men	Total
British Army:					
Regulars	97,864	25	143	15,667	15,810
United States Army:					
Regulars	15,736	26	49	2,713	2,762
Additional force	11,186	15	36	2,085	2,121
Volunteers	73,260	10	Not stated	6,448	6,448

Forces	Invalided and disabled			Aggregate loss
	Total officers and men	Loss per cent		
		Per month	Total	
British Army:				
Regulars	16,050	0.65	16.40	31,860
United States Army:				
Regulars	2,155	0.53	13.69	4,917
Additional force	881	0.52	7.87	3,002
Volunteers	9,169	1.25	12.51	15,617

The losses of the British and French forces in the Crimea, as compared with the American in the Mexican War, Coolidge gives as follows:

Army	Aggregate	Months in service	Total died	Loss per cent		Total invalided	Loss per cent	
				Total	Annual		Total	Annual
French	309,268	25	62,492	20.20	9.72	65,069	21.04	10.08
British	111,313	25	21,097	18.95	9.12	16,308	14.65	6.96
United States	100,454	.....	12,896	12.83	.....	12,252	12.19	.....

Army	Total loss	Loss per cent	
		Total	Annual
French	127,561	41.24	19.80
British	37,405	33.60	16.08
United States	25,148	25.02	.....

In the matter of caring for the wounded, the French had, at the start, a better sanitary service than the British, who entered the war, medically speaking, in a state of unpreparedness. The French had shelter tents (*tentes d'abris*), while British officers and men lay on the ground without protection; they had their baskets of medical supplies (*cantines regimentaires*), two for each battalion, carried on pack animals; their ambulance tornisters (*sacs d'ambulance*), one for each battalion, contained splints, drugs and material for bandaging, and with these went a cylindrical brass box of surgical instruments; their cavalry and artillery had black cowhide wallets (*sacoches d'ambulance*), two pair for each cavalry regiment, one pair for each park of artillery, containing instruments, medicines and bandages,[13] they had two-mule ambulances, where the British, at the Alma, had not a single one. After the battle of the Alma, they lent ambulances to the British and transported their sick to Balaklava on the backs of mules. They had good farriers to take care of their transportation animals. Their soldiers were soon selling French bread from their bakeries to the British, or exchanging them for ration biscuits to thicken their soup. From Algerian experience, their troops knew how to utilize wild plants as salads. Early in November, 1854, the French soldiers were supplied with loose-fitting fur overcoats, while the British had lost their winter clothing by the foundering of supply ships.[14] Yet as the campaign wore on, the sanitary service and condition of the British Army improved to a maximal degree, while that of the French went progressively down. The story is told in Longmore's comparative statistics of sickness and mortality from sickness in the two armies.[15] The total number of deaths among the British noncommissioned officers and men from April, 1854, to June, 1856, was 18,058, including all who died in the field or in hospital from wounds and disease. Deducting 1,761 deaths from wounds, we have 16,297 deaths from disease, or

From April, 1854, to August, 1854, inclusive	1,291
From September, 1854, to June, 1855, inclusive	13,150
From July, 1855, to June, 1856, inclusive	1,856
Total	16,297

Chenu gave the total losses of the much larger French army from all causes as 95,307.

The earlier French statistics of the campaign are not suitably arranged and scaled for comparative purposes, but Sir Thomas Longmore gives the following tabulation of British and French losses from September, 1854, to April, 1856, excluding deaths from wounds and cholera:

[13] Myrdacz: *Op. cit.*, 3–4.
[14] Longmore: *Op. cit.*, 22–23.
[15] Longmore: *Op. cit.*, 7–18.

Date	English losses	French losses		
		In field hospitals	In interior hospitals	Total
From September to December, 1854, inclusive	2,373	984	873	1,857
From January to April, 1855, inclusive.....	7,389	1,828	5,838	7,666
From May to August, 1855, inclusive.....	923	4,641	5,904	10,545
From September to December, 1855, inclusive	463	3,234	5,239	8,473
From January to April, 1856, inclusive.....	218	8,959	8,170	17,129
Total.....	11,366	19,646	26,024	45,670

By comparing the mortality of September-December, 1854, with that of the same period in 1855, it is seen that there was a *decrease* of 80.49 per cent in the rate of the British mortality in the latter period, and an *increase* of 62.80 per cent in the rate of the French mortality; comparison of the deaths of January-April, 1855, with those of January-April, 1856, shows a decrease in British mortality of 97.05 per cent and an increase in French mortality of 57.43 per cent. During the winter of 1854–5 there were 175 deaths from scurvy in the English army and 145 in the French; during the following winter (1855–6) the English had but one single death, and the French 964. In the first winter the British had 2,286 deaths from fevers and 129 in the second. During the first winter the British lost 164 men from typhus fever, the French 90; during the second winter the British losses from typhus were 16 only, those of the French 10,278. During the first winter 3,196 British soldiers died from diarrheal disorders; during the second winter, only 37. During the first winter the French had 3,214 cases of frostbite with twenty-six deaths, the English 1,923 cases with 457 deaths; during the second winter the French had 2,076 cases, the English only 475. Making every allowance for the greater war strength of the French Army, the effect of improved sanitation in the British Army and the simultaneous slackening of French sanitary efficiency is everywhere manifest.

As Longmore says, "The health conditions were completely reversed in the two armies," although the terrain and climatic conditions were the same for both. The British lost 10,283 men from disease alone during the first Crimean winter (November, 1854–April, 1855) and only 551 during the following winter. The French had just the opposite experience. In explanation of these phenomena, Sir Thomas Longmore reasons as follows. The root of the evils which befell the British during the first winter of the war "was undoubtedly the neglect of the old maxim, *to be prepared for war in time of peace.*" "Nothing," he says, "was

ready for a state of war," not even the Medical Department. The lessons of earlier campaigns, particularly the recorded experiences and recommendations of army surgeons from the Peninsular wars, were cast aside and disregarded, a common enough procedure at all times and places. Had these been acted upon, "there would have been an organized army hospital corps, suitable field-hospital establishments, suitable field-hospital transport, suitable field-equipment, adequate in amount and ready at call for service, but there were none of these when the campaign commenced. Repeated experiments were made in some of these matters after the war had begun, but severally ended in so many failures. It was only after the conclusion of the war—and some years after—that the improvements in army medical organization, and in the plans and arrangements of the field-hospital establishments were successively effected, which have since been embodied in the authorized codes of army medical regulations."[16] Furthermore, the stalwart British troops first sent to the Crimea were badly weakened as to their powers of resistance by their previous twelve weeks' residence "in the notoriously unhealthy valleys of Bulgaria, where malarial influences were rife, and cholera and choleraic diarrhea had prevailed." When they arrived in the Crimea, conditions were not much better.

After the landing followed the bivouacking without tents or cover, every one lying and sleeping on the damp ground, and subsequently the hardships, privations, and sufferings of the winter siege—the exposure to cold, and the loss of rest, in the trenches and on picquet duty at night; the ill-suited clothing, the tight coatee and closely fitting trousers of that time; the want of fuel; the want of means of personal cleanliness; the excessive overwork, increased, as the numbers lessened, among those who remained; the want of adequate nutriment, all hygienic rules outraged in respect to sufficiency, quality, variety and cooking of the food—the rations consisting almost exclusively, for a considerable time, of salt meat and biscuit without vegetables. Under such conditions, can it be wondered that scurvy, fevers, and bowel disorders were prevalent, and that the ability of the men to resist the depressing agencies around them became almost wholly exhausted? The elements, too, seemed to combine with the other evil influences in adding to the misery of the overworked troops; for the hurricane which occurred in the middle of November, sweeping away for the time such shelter as had been then got, inundating the ground with moisture, together with the bitter cold which accompanied the storm, aggravated the sufferings of all ranks; while the loss of the large vessel, the *Prince* with the stores of woolen underclothing contained in it, constituted quite a calamity at the time. But these were relatively mere passing incidents in the great catastrophe—increasing the sufferings of the troops for the time, but having little part in producing the general morbid infection of the army. This was due to the two great factors I have

[16] Longmore: *Op. cit.*, 19–20.

adverted to—the want of preparedness on the one hand, the neglect of even the elementary teachings of sanitary science on the other.[17]

During the same period, as we have seen, the French troops had their sheltered tents, ambulance, sanitary matériel, fur coats, excellent food supplies, and, above all, a well-organized and efficient transport for supplies and carriage of the sick and wounded.

As soon as this state of affairs became known and realized in England, every effort was made by Parliament and the British public to relieve the situation. Supplies, clothing, sanitary matériel, and means of transportation were sent out in profusion. Roads were made, new hospitals constructed and the troops were housed in ready-made wooden huts, "so that the camps on the plateau became converted into wooden towns." At the instance of Lord Sidney Herbert, Florence Nightingale went out with her corps of trained nurses, and what she accomplished created modern nursing. But all this cost more in the long run, was less economical, than a sensible, thorough-going preparedness at the start, and, as Longmore observes, the wooden huts and the extravagances of creature comfort that went with them would have been thrown away in a day if circumstances had required that the British Army move away from its position before Sebastopol. The opinion of Chenu that the healthy condition of the British and the unhealthy condition of the French during the second winter was due to the superior influence and authority of the British Medical Department is, in Longmore's judgment, quite erroneous. The improved condition of the British soldiers was due to the generous impulse and prompt action of the whole English nation. The influence and authority which Chenu attributed to British medical officers at that time was entrusted to them only after the lengthy official investigation following the Crimean War.

The causes which were operative in destroying the health of the French Army during the second winter were investigated by Lévy, Baudens and Scrive, the successive inspectors general of the French Sanitary Service in the Crimea. The French troops were still under canvas, less protected from the hardships of a Crimean winter than the British, weakened by hard work, insufficient sleep, inferior and insufficient rations. These conditions affected alike the veterans of the campaign, worn out with prolonged exertion, and the raw, youthful reënforcements. The French nation had lost its enthusiasm for the cause and its government was then hampered by Tennyson's

"eternal want of peace
That vexes public men."

[17] *Ibid.*, 20.

The havoc made by scurvy and typhus among the French soldiers was due to the way in which the French medical officers in the field were overborne and their advice disregarded by the *intendance.* Telegraphic orders from Paris proved, in the end, a nuisance as well as a bore. The natural powers of resistance of the troops being diminished by fatigue, hardship and physical decay, the seeds of typhus found an apt soil for infection, and the disease spread to the extent that the means and the knowledge of the time were powerless to cope with it. All this led the French Government to terminate hostilities and withdraw its forces from the Crimea before the ultimate aims of the campaign were accomplished.

The Crimean War cost Great Britain $335,340,000, France, $451,980,000, and Russia, $690,120,000.

The medical disasters of the Crimean War are events which have occurred and recurred, time and again, in wars of the past, and are likely to recur in the future. They were due to lack of forethought, of rational preparedness, on the one hand, and, on the other, to the fact that a central civil administration will do little for the conduct of a campaign if it neglects its primal duty of sending all necessary supplies, reinforcements and medical aid to the forces at the front, yet hampers their commanders and medical officers with orders and suggestions based upon academic assumptions and insufficient knowledge of the actual conditions at the seat of war.

EDITORIAL

ON LOYALTY

A preachment on the above text, to medical men who have forsaken home, friends and livelihood, to respond to the call of the country, might at first seem superfluous and, in a national sense, it is. But in a narrower sense, in respect to loyalty to the human units which together compose the military machine, it is perhaps more needed by medical officers than any other military class. For doctors, when they enter the service, are men, mature not only in age but conviction, whose very professional training has cultivated the qualities of individuality, personal initiative and self-reliance. Instead of deferring and looking to others for direction and guidance, they have been taught independence of thought, decision and action as a necessary corollary to professional training.

Every physician has his successive professional problems to solve, and the very nature of these problems requires that they shall be solved promptly and without recourse to others. Individualistic as is the average American, it is in the American physician that this quality of independence is exalted to the highest degree. It is as an individual that in his practice the doctor achieves success or suffers failure. Neither in mind or hand is his work coördinated with others, save in occasional consultations—and even here there rests no obligation to accept advice or follow recommendation.

But, in the military service, loyalty to organizations and individuals is necessary. Loyalty between those of greater and lesser rank, and between those of diverse status, duty and authority, is the mainspring of military efficiency. Without it, there can be no proper coöperation and success. Without practical unswerving loyalty in the military establishment, loyalty to the nation itself is mere lip service and pretense. For team work alone counts. As officers we come to think not in terms of individuals but of myriads. Our plans primarily concern the greatest good to the greatest number, and such plans, to be a success, must be supported whole heartedly and without qualification. Even a relatively poorly conceived plan may become successful if all unite to make it so.

In the military service each has his own part to play. From the very nature of war, few of these parts can be those of personal choice. But every part opens to wider opportunity. Each in the service is in a position where he must not only direct others but be himself under direction. It should go without saying that he must accept these dual

obligations with efficiency and fairness to the one and with unreserved and loyal compliance to the other.

To many who are now for the first time meeting with the experiences of the military service, the realization that they must merge their identity in the great medical war machine of which they have become a part undoubtedly comes as a shock. But it is obvious that there must be community of purpose and method, and these can only be determined by war plans and military necessity. Of these plans and necessities, in their larger aspect, only a few can know. Much that may seem illogical could be explained did not the military situation demand silence. Much of apparent friction could be avoided if all carried out their orders and performed their duties with unswervng loyalty, even if with the unspoken question.

Helpful criticism is welcome, but criticism of a method can and should carry no element of personality. Destructive criticism, which offers to replace nothing of what it would tear down, has no place in the military service. The nation demands all there is in us—and there is no room for petty disagreements, friction or jealousies as to personality, purpose or method. If it appears that any individual falters under the load, all the more reason to bring him prompt support. If any method seems imperfect, coöperation will bring it by so much nearer success. The same unselfish loyalty that is expected from those lower in rank should be given to those higher in the military organization.

There may be a few possessing such mental attributes that they find themselves unable to become adjusted to the requirements of the great machine into which the units of the medical profession must resolve themselves in going to war. For such, the most effective remedy is found in public opinion, as developed from the common sense of the profession in uniform as a whole. The captious critic, he of the exalted ego, the underminer of authority, the sapper of *esprit de corps*, should be made to realize his unpopularity in an organization and profession which is dominated by the will to achieve and to deserve well of the nation and humanity.

In the great task upon which we are engaged there must be no attempt to create artificial differentiation of class or service. The immensity of the burden has practically made the medical profession of the United States the Medical Corps of the Army. Whether one wears the collar mark of the regulars or of the reserve or of the militia, all are medical officers playing the same game in team-work for a common end, and the profession at large will reap the reward of mutual success or carry the burden of composite failure. In the public medical services

there is no professional competition other than a justifiable emulation which makes each officer eager to perform his task creditably for the sake of the common welfare. There is no room for advancement through the hampering of another. He serves best his own interests who best serves his comrades and his country. He serves his country best who sinks self in the common purpose.

For many years the profession in civil life has made its representatives in the government services its honored guests at clinics, in hospitals, at medical societies and wherever professional efficiency could be advanced. For long, reciprocation for their kindness was impossible. But now the time has come when some, at least, of these courtesies can be returned. The physicians of the services welcome their brother officers new from civil life and gladly extend to them such facilities and assistance in assuming unfamiliar functions as it lies in their power to give. As they turn part of the burden over, their one idea is, by assistance and counsel, to make the task as easy as possible to those from civil life who now assume it and to help in the avoidance of difficulty, friction and mortification, so that the result may be one in which all may have justifiable pride.

In one of the great Medical Officers' Training Camps, the rostrum of the auditorium bears this inscription: "Do It Well—Do It Now—Do It Cheerfully." It embodies much of the philosophy of the service. He who in loyalty, not only to his country but to those whom the fortunes of the service have put over him, carries out these homely precepts goes far toward achieving success for himself, reputation for his corps, honor for his profession and victory for his country.

E. L. M.

THE CROWNING INFAMY

It is the sad distinction of the Medical Department to furnish the first casualties of the present war and to have the names of its medical officers head the Honor Roll of the killed and wounded.

But the bombing of one of our army hospitals is only what was to be expected, and only one of a long series of similar officially planned offenses against humanity which the savage Hun has carried out in his war of extermination against not only men but women and children—against not only those in arms but the noncombatant aged, infirm and helpless. In his scheme of "efficiency," no opportunity to wreak his coldly calculated cruelty is too small to be overlooked or too despicable to be refused.

In the unresisting medical officers and nurses at their humanitarian tasks, in the wounded whose very helplessness should have been their

safeguard, the Teutonic mind sees only a ready prey, all the more to be sought out and destroyed because this can be done without danger. They were relieving suffering other than in Germans, hence on them the death penalty was imposed. As to the cripples on their cots, they were to be destroyed lest some recover to lift a staying hand against the kind of "kultur" which scientific barbarism had planned to impose upon the world.

It is one with the sowing of disease germs and the poisoning of candy and water among the civil population, the torpedoing of hospital ships on their errands of mercy, the use of poison gases, the bombing of schools, raping of women and deportation of men by which the unspeakable Hun makes war against non-combatants in the hope that he can thus subject the world to his rule by terror.

But the opposite will be the case. Inhuman brutality to the helpless merely turns to steel the purpose to draw the fangs for all time from the beast that does such things. It demonstrates the blackness of the abyss into which the baffled Teuton would hurl civilization. It reveals again his complete failure to understand the psychology of others who, instead of yielding to fear, rise against aggression.

This single act, instead of helping to paralyze opposition, will raise armies against him. The blood of the helpless is the seed from which will spring myriads of men full panoplied for war. Instead of weakening through terror, this Potsdam victory over the hospital of the Medical Department is the one thing needed in this country to give its determination the fighting edge.

Nothing more is necessary to complete the dishonor of the Hun. It is one of the crimes which, generations after war is over, will make him the detested outcast of all civilization. It is the crowning infamy.

This nation stands, clear-eyed, wrathful and unafraid, to hold the butchers of the helpless to a bitter accounting.

E. L. M.

THE DENTAL RESERVE CORPS

The Military Surgeon feels assured that the members of the dental specialty now being called upon for service in the Dental Reserve Corps will freely and willingly meet all the conditions which such service demands. We are informed that the national association has taken the necessary action to obtain a census of the dentists throughout the country and is already in position to furnish the authorities with the available information and statistics.

On a basis of one dentist per thousand of strength, at least 1,500 will be required almost immediately and not less than an equal number

more in reserve for emergency, which will surely soon arise. There are in the United States 40,000 dentists, half of whom are probably available for military service, though there is little likelihood of any such number being required by the forces; nor indeed could they be spared by the civil population. No one can question the importance to the community of skilled dental aid and this is becoming more and more appreciated in the military service. It would seem that the medical profession generally and the dental specialists themselves are now more fully realizing how important the mouth and its appendages are in the economy of the body.

Such being the case the dental specialty, the acquirement of a knowledge of which has each year recently demanded higher attainment, is becoming to be recognized as of far greater importance than formerly, in maintaining the health of the people. Finally the wonderful prosthetic work its practitioners have accomplished thus far in war injuries and the larger field which is opening to them in this direction will soon place the dental surgeon on a par with other special surgeons, if such is not already the case.

Members of the Dental Corps of the Medical Departments of our Army and Navy are now duly commissioned officers, entitled to all the rights and privileges attached to a commission and the Association of Military Surgeons will at its coming meeting consider an amendment to the constitution to include in eligibility to its membership the officers of the Dental and Dental Reserve Corps.

COMMENT AND CRITICISM

First Lieut. William C. Speakman, D. O. R. C., U. S. A., whose extensive and successful practice of dentistry while on duty with the American Ambulance in France is evidenced by his papers published in this journal, has sent THE MILITARY SURGEON the following communication on the dental surgeon and his work in the present war.

In these days when so many of the ills that flesh is heir to seem to begin in the mouth, it is quite important that we should get into closer touch with our colleagues who practice this specialty, and particularly with those who are giving attention to dento-military surgery.—EDITOR.

WAR DENTISTRY

"Soldiers, to the number of a division and a half, have been kept at the front, through the services of the dental surgeon." This statement was made to me one Sunday morning in early 1916, by an official in the War Department in Paris, whom I had met in 1915 during my service in that year, and upon whom I had called, to inform him I had returned to France, and had brought from America a fully equipped, dental field ambulance—in other words, an operating room on wheels. "You could not have brought to France a more welcome gift!" My friend went quite at length to tell me of how his own dentist, a professor in the Ecole Dentaire of Paris, had suggested such cars to the dental profession, and was the instigator in outfitting the first that were sent. Mr. Herbert Cory, an American newspaper correspondent, as early as 1915 saw the enormous need of well-conditioned mouths at the front. We happened to return to America on the same boat in that year, and had many talks about the dental conditions in the army, the hospital service of the dental surgeon, and the results that he was obtaining in the so-called jaw cases, so that it did not take very much urging upon the part of an American Ambulance official for me to design, equip and take to France the dental ambulance, photographs of which illustrate this article. I found also supply houses most eager to contribute to the supplies which I took with me, and I could have filled the car many times over through their generosity.

When I returned to France with the car, I again met Mr. Cory, and together we visited both the French and English cars and conversed with their crews. All this, and his conversation with me, led to a story to his American papers, in which he started out with the assertion that a division and a half had been kept at the front by our efforts, the statement which I had made to him. He went on to say that today the dental surgeons are taking their kits back of, and into the

lines, where they are giving men relief, and making a masticatory surface for them, directly under fire. The dentist is becoming almost as much of an army authority as the army surgeon; but it was not this way at the beginning of the war. England tried to restrict the enlistment of her men to those with sound teeth (as we are trying to do at the present time), but she found the need of men was too great, and the bars were let down. France had too many greater things to worry about and she took her men as they came, even if they were toothless. But after the flurry of the first few months and war began to settle down into a business, the authorities listened to the surgeons, who insisted that the wounded man whose teeth were bad made a retarded recovery. Men were sent home on sick leave, whose only trouble was their molars. When they were fixed up, the man got well, and it became evident that the soldiers' teeth must be cared for.

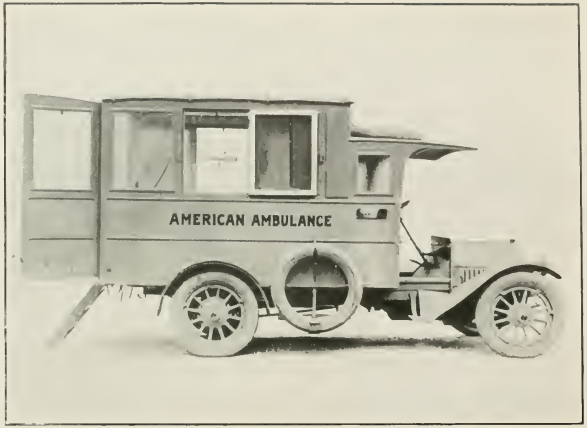
The time-worn and threadbare assertion of Napoleon that "the army travels on its belly" has been supplanted by the assertion that recently appeared in this journal, that "a soldier travels on his feet." But in order to travel on his feet he must have caloric force, and the caloric force must come from his stomach, and his stomach must be given force properly prepared. The army ration is an "iron" one, even when it does not come in cans. The meat is probably tough, and the bread flint-like. The man who cannot masticate, bolts his food and loses strength and endurance. "Fix their teeth," said the high command, "but fix them at the front." The soldier's *morale* is impaired by absence from the line, and he loses that hard fatalism he must have to be a good soldier. He becomes a civilian in a uniform. Galliéni, the late Minister of War, realized this. On February 26, 1916, he suggested to President Poincaré, after his observation of the usefulness of the dentists for something over a year, rendering aid to their comrades in an offhand way, that they be taken from the lines, regularly appointed a part of the medical service, and be given the rank of "Sous-Adjudant." Godard, Chief of the Service de Santé, concurred with Galliéni's suggestion, and it became an order on March 3, 1916.

The average military tooth is a sad affair, and the French tooth is little better. Probably no average inhabitant of thirty, who is now a soldier in the lines, expects to have more than a quorum of the teeth that he began life with, and he knows less about their care. He may never have used a tooth brush in his life. He is used to getting along with the toothache, and to chewing on a tooth and a half. It seems to him the normal order of things and, once his teeth are in order, it is quite wonderful the appreciation he expresses and the pride he takes in

Lieut. Speakman, D. O. R. C., U. S. A.. His Car, His Faithful Friend, a Soldier of the Line and a Chasseur Á Pied

(To face page 480.)

Inside of the American Dental Car.



Outside of the American Dental Field Ambulance.

(To face page 481.)

them, and the care that he gives them after he is taught to do so. When we visit a hospital these days, constantly we see in the soldier's little personal kit, or on the little grey or white table at his cot's side, a tooth brush.

The dentists who have been sent to the front have demonstrated their usefulness. The division and a half, which would have otherwise been sent home except for them, is evidence. Thousands of men have been relieved from pain and have been given better masticatory outfits. Practically every soldier needs some dental care. "The dentists have never been given a chance to show their good-will towards France, as the physicians have," said Mr. E. Piatt Andrews, who directs the transportation service of the American Ambulance. Their willingness to help is shown by the abundance of materials and equipment which they accumulate and take with them.

The American car is the eleventh car to take the field for France. Two of the others are English gifts to France, and the rest are of French design and equipment. It is interesting to know and to show the manner in which France is using her damaged human material, that these cars, *i. e.*, the French, were very largely built by this same "damaged human material." I saw a carpenter, who had a wooden leg, working upon one, and another ex-soldier, who had but one arm, painting. The English cars are heavy. They weigh 4½ tons. The French cars are somewhat lighter. The American car, which is mounted on a three-quarter ton Buick chassis, weighs but 2 tons. All the cars carry a large stock of supplies stowed away in lockers. They have a sterilizer fastened to the inside of the car, and the water is boiled by means of gasoline burners. They all have water-tanks, little stationary washstands, the usual engine and chair, and a lathe for grinding is at the rear, in all three types of cars. The French, for emergency night work, use a gasoline torch; the English, the carbide, such as was used with our first automobiles. The American car has an electric dome over the chair and uses the stored-up current from the battery of the car. The particular advantage of an ambulance, equipped as I have described, is that it may be telephoned for, and go from place to place, giving relief to men in several different regiments of the division to which such a car may be attached. In this way men are not compelled to leave their particular sectors and journey to wherever the car may be stationed. It has a further advantage of being easily withdrawn to the rear during an attack. Consequently, it is not in danger of being demolished.

The French and the English personnel of the cars consist of a dental surgeon, his assistant, a mechanic and a chauffeur. But it always

struck me as a saving in men, if the mechanic could at the same time be a chauffeur. Necessarily, it is not possible to work during transit.

Many times have I been roused out of a sound sleep and given relief to some poor "poilu," who had been enduring his gum abscess through the long hours of the night and which, because of the cold night air, pained him all the more. Likewise to the soldier with a congested pulp in a molar, who may have walked several miles to obtain relief.

We visited and talked with Lieutenant Taylor of one of the English cars—namely, Number Ten in the records—and Taylor said, "We have seen the day when the man sat on a soap-box and we did what we could. But the Germans saw it first," said Lieutenant Taylor, and he should know, for he was in Brussels when the Germans came, and for a time they seriously considered shooting him as a spy; but they let him work in a hospital until Von Bissing took charge of affairs. Von Bissing was not soft in his methods, and Taylor got out. He escaped from Belgium by the sea-end of the line, crawling under the barbed wire and walking for miles in the mud. At that time, he said, the Germans had a dental post every 10 kilometers. Every man passed an oral inspection. If he needed care, he got it. The German surgeons thoroughly realized that a wounded man makes a better recovery if his teeth are in good condition. No doubt lives have been saved in this way.

Mr. W. H. Dolamre, L. R. C. P., in the course of his presidential address at the Thirty-fifth Annual General Meeting of the British Dental Association, said that "never had the disasters which may follow the neglect of the teeth been more apparent that at the present time." It needed but the cursory examination of the recruiting officer to prove the truth of what the Association had said, that disaster did follow the prevalence of this neglect. It is no secret that the army authorities first refused men with bad teeth, but so many such presented that later they were admitted, irrespective of their dental conditions. Having been admitted, it was found that either their teeth must be treated or these men would not be available for foreign service.

Years ago, school dentistry and the teaching of oral hygiene to our school children had been advocated, but the advice was disregarded or taken up grudgingly. The importance of this was admitted, though its practical application was neglected.

Now we have come to realize that, when the teeth are diseased, the lack of masticatory power is secondary to the harm resulting from the forming of centers, whence general septic infection starts. Then, too, there is the need of dental aid in the treatment of injuries to the jaw and of maxillary fractures, and especially the designing and fixing of

interdental splints, which is a very special work, in which experience is gained only after many years, with special opportunities.

It has been observed in many of the cases of fractures of the jaws which reached the base hospitals, that infection had set in, and in some cases repair had commenced, and fibro-osseous regeneration had taken place. The field ambulances, equipped as they are with appliances to rapidly make a splint for the fracture, would overcome this to a great extent, and with the present and improved methods of preventing infection, it seems very probable that the dental surgeon will be the means of lessening the time of treatment and obtaining far better results.

My notes and observations go to show that the soldier wounded in the jaws requires, in many instances, a much longer time to make a complete recovery than one wounded in the body. This is due, of course, to the desire upon the part of the general surgeon and the dental surgeon to dismiss the patient with the least possible disfigurement. Wounds of the body are covered by the clothing and a soldier does not so much mind a cicatrix on the arm, the shoulder or the thigh, but the scar left from a wound of the jaws where there is a loss of more or less fibrous and especially osseous tissue, is a very conspicuous and lasting facial disfigurement. Every conceivable effort is being made by the surgeons, who are specializing in facial wounds, to obviate this, and the aid that the skillful dental surgeon is giving them is only measured by his ingenuity and ability quickly to bring the remaining fragments of the jaw into juxtaposition and hold them there, by artificial means; thus bridging the intervening spaces with fixtures over which the surgeons may stretch the soft tissues and build for the wounded man a new lip or new cheek, with the least possible disfigurement. Later on bone grafting, which is becoming more and more universal, supplies new osseous structure, but until the time when the surgeon can do this, the dental surgeon must supply the fixture for holding the parts in place. At the beginning of the present war and before the centers for prosthesis were organized, this was not possible, and the surgeon made out the best he could and well indeed under the circumstances. But in order to obtain the acme of results, these cases later on had to be operated upon, the regenerated tissues broken up and put back into their normal position. This is one reason why the so-called jaw case is so long in a hospital.

It is my contention that the trained surgeon, skilled in caring for these particular cases, working in conjunction with an equally skillful dental surgeon, who sees the patient immediately after he has been wounded, may do away with this long-drawn-out reconstruction and obtain far better results in lessening facial disfigurement.

A CONSULTING STAFF FOR THE MEDICAL DEPARTMENT

One of the remarkable developments of the current war is the detail in the organization of the sanitary department, the only redeeming feature in this welter of blood and iron that, but for it might make us doubt if all our boasted humanity is aught but surface deep and beneath is the same primitive man, only a degree removed from the animal.

We use the term "sanitary department" in its collective sense, which includes the medical department and its great auxiliary the Red Cross.

Lieut. Col. Wm. J. L. Lyster, of our Medical Corps, who for a year or more has been a military observer in Europe, writes informally that his observations lead him to the conclusion "that we should have consulting physicians and surgeons when we have the troops over here (there) in sufficient numbers and that some of the more notable of these should be placed on a board to be known as the Technical Board."

To illustrate his point he submitted two diagrams, which we have been permitted to reproduce here. (Figs. A and B.)

Colonel Lyster writes: "I have indicated such a board, of six members, with a view to having a specialist for each group of casualties, according to its numerical importance.

"This board should be something more than a professional consulting board. Each member of it could study the administrative problem in connection with his special group, as well as be the final professional authority in that subject. Meeting together, the whole board, as indicated on the diagram, could have an advisory function with reference to the handling (not transporting) of all classes of cases from the front to the time they leave Europe.

"They could, for instance, decide where at the front abdominal operations of urgency might first be done; at what point the first studies in shell shock might advantageously be begun; at what time important orthopaedic intervention should first be introduced as a specialty and kindred questions.

"A more ample power should be theirs in the institutions of the base and in the area in which I have indicated as the 'reconstruction area.' Here they should be almost supreme except, of course, where military exigencies must overrule them. Their actions should be guided and modified by the presence on the board of a Regular medical officer, familiar with the demands of the service and its methods.

"I think in some such way we could get the best return from our highly trained professional men, introduce most promptly new methods and give the more able of these brilliant specialists a field worthy ofthem."

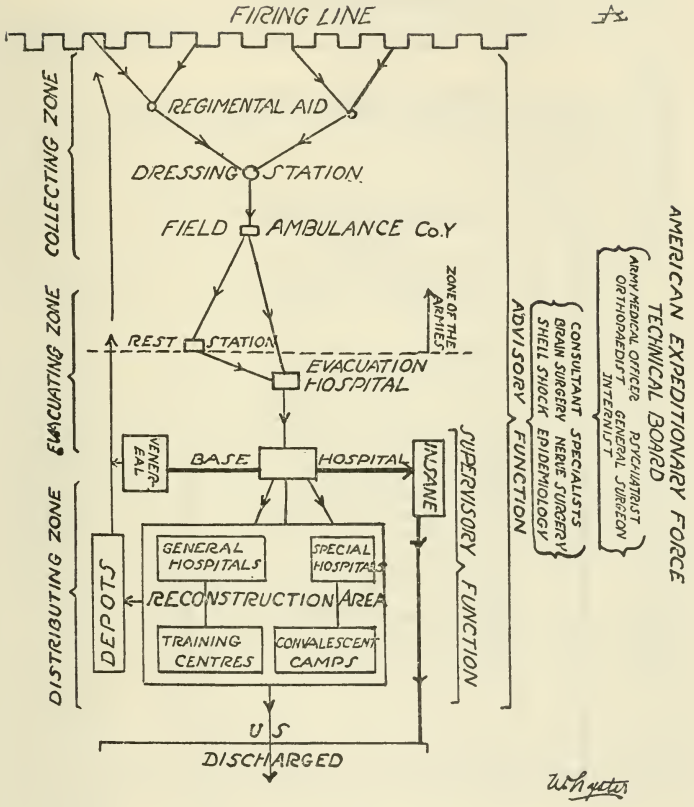

FIRING LINE
REGIMENTAL AID
DRESSING STATION
FIELD AMBULANCE Co.Y
REST STATION
ZONE OF THE ARMIES
EVACUATION HOSPITAL
VENEREAL
BASE HOSPITAL
INSANE
GENERAL HOSPITALS
SPECIAL HOSPITALS
RECONSTRUCTION AREA
TRAINING CENTRES
CONVALESCENT CAMPS
DEPOTS
U S
DISCHARGED
COLLECTING ZONE
EVACUATING ZONE
DISTRIBUTING ZONE
SUPERVISORY FUNCTION
ADVISORY FUNCTION
CONSULTANT SPECIALISTS
BRAIN SURGERY
NERVE SURGERY
SHELL SHOCK
EPIDEMIOLOGY
ARMY MEDICAL OFFICER
ORTHOPAEDIST
PSYCHIATRIST
GENERAL SURGEON
INTERNIST
AMERICAN EXPEDITIONARY FORCE
TECHNICAL BOARD

FIG. A.

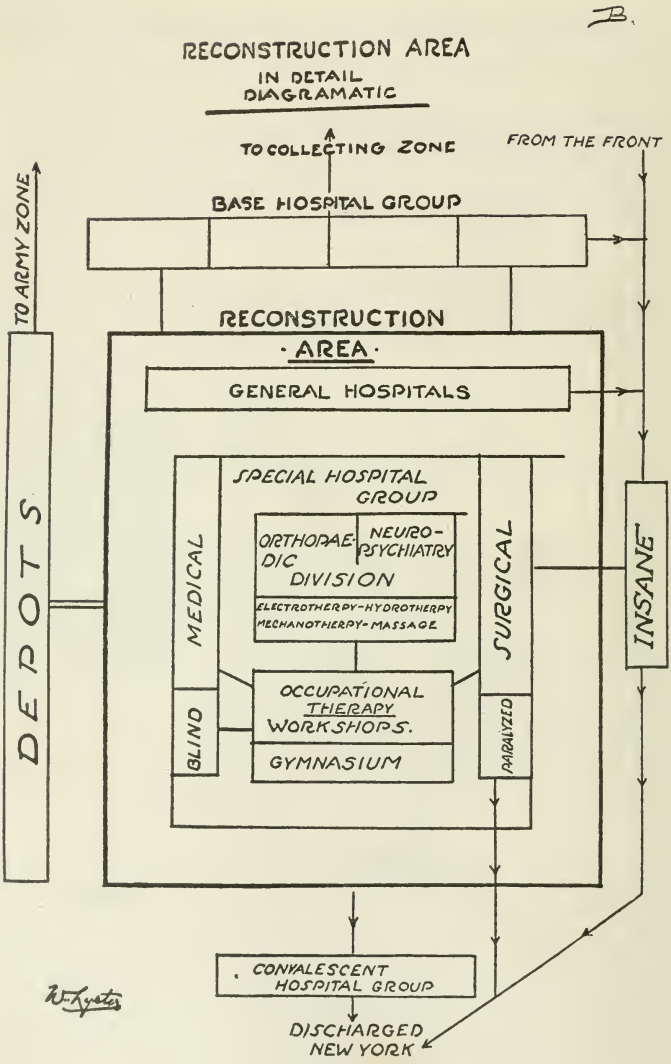

B.
RECONSTRUCTION AREA
IN DETAIL
DIAGRAMATIC
TO COLLECTING ZONE
FROM THE FRONT
TO ARMY ZONE
BASE HOSPITAL GROUP
RECONSTRUCTION
·AREA·
GENERAL HOSPITALS
DEPOTS
SPECIAL HOSPITAL
GROUP
MEDICAL
ORTHOPAEDIC
DIVISION
NEURO-PSYCHIATRY
ELECTROTHERPY-HYDROTHERPY
MECHANOTHERPY-MASSAGE
SURGICAL
INSANE
BLIND
OCCUPATIONAL
THERAPY
WORKSHOPS.
GYMNASIUM
PARALYZED
CONVALESCENT
HOSPITAL GROUP
DISCHARGED
NEW YORK

Fig. B.

CURRENT LITERATURE

Recent Medical Research in Germany

"Clinical and Bacteriological Observations on Dysentery during the Summer Campaign of an Army in Galicia and Russian Poland," by Drs. Dorendorf and W. Kolle (*Deutsche Medizinische Wochenschrift*, No. 19, May 11, 1916, pp. 561–564).

At the commencement of the invasion of Galicia single cases of dysentery occurred. With the advance of the army the number increased and reached its maximum in August in Russian Poland. The disease was transported with the troops to South Hungary and Serbia. In its lightest form during midsummer, the disease was widely distributed in the army; there was scarcely a man that did not suffer from gastro-intestinal catarrh." The men felt slack, had loss of appetite, and for a few days irregular stools and often flatulence; then diarrhea occurred with slight colicky pains. Fever, as a rule, was absent. In other cases prodromal symptoms were simply absent and, in complete health, the disease appeared, often during the night, with colicky pains and copious diarrhea.

In the cases of gastro-intestinal catarrh the stools were semi-solid with particles of mucus, the size and appearance of a boiled sago grain. Only rarely was there a slight admixture of blood. Microscopical examination showed the mucus particles to be composed of white cells and a few red blood cells, a few intestinal epithelial cells, and rods mostly large, thick, non-motile bacteria.

Suitable dietary without any drugs cured most of the slight cases. From the slightest to the severest affections transition types occurred. In the severely affected the character of the disease altered on the third day or later: the colic became more severe and frequent and the diarrhea more abundant. In the intervals between the stools a few cubic centimeters of mucus stained with blood, or mixed with a considerable amount of blood, was pressed out, accomwith pain about the anus. In twenty-four hours there were often a hundred evacuations. Certain cases evacuated bloody stools for days.

In the majority of the severe cases blood in some quantity persisted in the stools from six to ten days. Abdominal pain was usually referred to the umbilical region. Pain on pressure was elicited over the whole of the large intestine, or parts of it, frequently in the region of the superior flexures, in other cases in the caecum, and very frequently in the sigmoid flexure.

With severe tenesmus, prolapse of the large intestine sometimes occurred. Sleep was disturbed. The amount of nourishment taken was small. In a short time the patients became extremely weak, and finally passed their stools in bed under them. The most severe cases lay whining in bed, anxious to avoid the slightest movement lest it called forth fresh attacks of colic.

In some cases the clinical picture resembled that of cholera. Mixed infections of dysentery and typhoid or paratyphoid, and dysentery and cholera, were observed frequently.

Death was due in most cases to a fall in the arterial pressure, patients being pulseless for several days, with sub-normal temperature. In some cases death

was due to perforation and peritonitis. The temperature curve of the patients showed nothing characteristic. Slight cases ran an afberile course, or with slight rises of a degree or two for short periods. Usually the curve showed marked daily variations. In many cases it resembled the typhoid curve. In the most severe cases there was a collapse temperature for days.

The pulse rate corresponded to the temperature. During convalescence in severe cases slowing of the pulse rate to forty beats per minute was frequently observed.

Endocarditis has not been observed, but myasthenia cordis occurred during convalescence.

The duration of the disease varied from a few days to several months.

The disease clinically resembled bacillary dysentery. The bacteriological examination, however, showed, in the great majority of cases, none of the known dysentery bacilli. Also on post-mortem examination the dysentery organism was never recovered.

The delicacy of dysentery bacilli and the difficulty of isolating them in the field are not sufficient explanations of the fact that, in two infectious diseases hospitals, in which many more than a thousand quite fresh dysenteric, slimy stools were examined bacteriologically by the most able workers, only on six occasions was a known dysenteric organism recovered. (In these few cases it was a Shiga-Kruse bacillus.)

The cause of "Galician dysentery" is not, therefore, one of the known bacilli. Yet the course of the disease, from the lightest to the most severe cases, and its appearance in groups of cases in individual bodies of men, as soon as a case manifested itself, lead to the conclusion that the disease is one of enormous infectivity, a scourge of war, whose dissemination is most certainly the result of contact.

The mode of life of such patients offers innumerable opportunities for contact infection. The enormous frequency of the evacuations of the obviously highly infective stools, and the suddenness of the calls to stool, make it almost impossible for the cleanest patient to avoid soiling the bed and linen. Let us imagine the condition of a crowded advanced field ambulance, or an incomplete war hospital, on the eastern front. No wonder that in such conditions numerous infections occurred among the orderlies, sisters, and medical men, who were tried to the extreme limit.

But such massive infection was not essential. In excellently equipped war hospitals infections occurred to a comparatively high degree among highly trained personnel.

As regards infection, the severe cases were to the hospital personnel as the chronic carrier, chronic and slight case were to their comrades who bivouacked in the same tent and shared the same bread and other food.

I consider it probable that massive infection in some cases occurred through pollution of drinking water. In one case, the majority of the men of a column, who had drunk unboiled water from a village-well in Galicia, although this had been strictly forbidden, were attacked by dysentery one or two days later. Even the horses that had been watered from the well were for days, almost

without exception, severely ill with diarrhea, and a few horses died of it. It is probable that the enormous number of flies, which prevailed during the summer in Galicia and Russian Poland, also contributed to the dissemination of the epidemic.

Among the predisposing causes, the very strenuous exertions of the troops came first. Undue exertion leads to a lowering of resistance to all kinds of infection. Animal experiment shows that a slight permeability of the intestinal epithelium to germs may be produced through fatigue alone.

Secondly, the chilling produced by the cold summer night after the great heat of the day met with in continental Galicia climate must be regarded as injurious. And thirdly, and finally, are disturbances of the alimentary tract. Our army officers endeavored as far as possible to prevent injury from tainted food.

The most careful food-inspection is powerless against the poisoning of tinned food with the toxins of dead paratyptoid bacilli. The following example shows that alimentary disturbance is not the only factor in "Galician dysentery." In a war hospital, during the campaign, there were in addition to fifty-nine sisters, who were mostly attending to non-infectious patients, sixteen who were continuously employed in nursing the infected. The entire personnel lived under exactly the same conditions and were fed from the same kitchen. Of the sixteen sisters especially exposed to the infection, none went sick from dysentery, although some had slight attacks; of the other sisters four were severely attacked, and double the number slightly attacked. This was probably not due to special resistance, but to the careful instruction in antisepsis given to the sisters.

The mortality from dysentery was not high. The following are the figures from a war hospital:

Mortality of an Army in War Hospital

May (1915)	.4 per cent of attacked	August	11 per cent
June	0.5 per cent	September	16 per cent
July	9 per cent	October	13 per cent

Average 12 per cent of the sick.

The epidemic was carried with the troops to South Hungary and Serbia. In the Balkan area of battle at the end of September and beginning of October many severe cases occurred with a mortality of 8 per cent. The epidemic then rapidly diminished, and in November there was no fatal case.

II

The following are the results of the bacteriological examination of the cases of which a clinical description has been given above. In most cases the feces were obtained for examination immediately after they were passed. The examinations were carried out in a laboratory in the immediate neighborhood of the infectious diseases hospital under the direction and control of Professor Kolle with the assistance of Drs. Finger and Josephy. The post-mortem examinations were made as soon after death as possible.

The technique of the investigation was as follows: The fragments of mucus,

partly glassy, partly stained with blood, were examined microscopically both stained and unstained. The cultural investigations of fragments of mucus washed and unwashed, and of the faeculent parts of the stool, were carried out with media suitable for the cultivation of dysentery bacilli (Litmus-mannite, Drigalski-agar without crystal violet, etc.) as well as on ordinary media. Anaerobic cultures were also made. All suspicious colonies on the plate were tested with sera of types Shiga-Kruse, Flexner, Y, and Strong for agglutination, with careful controls. Where the agglutination test gave no final result, subcultures were made on agar slants which were further investigated.

The results of these cultural observations were somewhat surprising. The disease presented neither the clinical picture nor the post-mortem appearances of so-called "amebic dysentery" but, on the other hand, the above-mentioned clinical and epidemiological observations showed "Galician dysentery" to be a typical, infectious war-scourge appearing in epidemic form; accordingly, we expected to find the bacilli hitherto described as the cause of dysentery. The results of the investigations did not fulfil the expectations. These bacilli were not found in the large numbers of fresh stools examined, nor were they recovered from the stools of the same patient examined on many occasions; moreover, they were not found in the mucus from the surface of the large intestine taken post-mortem, nor from the ulcers of the large intestine. With the exception of six cases in which bacilli of the type Shiga-Kruse were found, two cases, in which type Flexner was found, and one case in which type Y was found, neither dysentery bacilli nor related varieties could be recovered.

As a result of the numerous investigations it can be asserted with certainty that the cause of the dysentery which occurred in epidemic form in Galicia and Poland, was not one of the hitherto described types of dysentery bacilli nor any related species.

CONCLUSIONS OF THE INVESTIGATIONS

1. That none of the hitherto recognized organisms of dysentery or new varieties were found in Galician dysentery.

2. That the cause of this dysentery, widely disseminated in Galicia and Poland, is neither an amoeba nor, in all probability, a bacterium.

3. Serum therapy, both with the antitoxic serum of type Shiga-Kruse and polyvalent serum, was absolutely without effect.

Such results obtained by us appear to indicate that the etiological significance of the so-called varieties of dysentery bacilli (types Y, Flexner, Strong) requires to be submitted to renewed critical tests. The bacilli of the Shiga-Kruse type have support for their etiological significance in the positive results of animal experiments and their toxic action. The etiological connection of other varieties of dysentery bacilli rests on weaker ground. It cannot be considered that positive agglutination with the serum of patients and a certain constancy of occurrence in epidemics, are proofs positive, because it is a disease of the large intestine and the bacteria can multiply secondarily and saprophytically in the inflammatory products of the mucous membrane, mucus, blood, pus.—*Abstracted from Indian Journal of Medical Research.*

H. G. Beyer.

Fascia Transplantation into Visceral Defects, an Experimental and Clinical Study,[1] by Harold Neuhof, M.D. In *Surgery, Gynecology and Obstetrics*, Vol. xxiv, No. 4, April, 1917, p. 383.

A masterly study of unusually great scientific and practical value, on a subject in surgery, that will be much appreciated by all those interested in plastic surgery and obliged to repair the damages done on the battlefield, by transplantations of tissues, in hospitals at the base.

It seems next to impossible to attempt to do justice to the great value of this study within the space allotted to a reviewer; it would, on the other hand, be a positive injustice to the Association of Military Surgeons not to invite, at least, attention to it through the columns of THE MILITARY SURGEON. The paper, not a paper in the ordinary sense, will require intensive study from beginning to end, with no paragraph or line left unconsidered, no illustration overlooked. The reward of such a study will be direct and sure.

Under the heading: "Technique of Fascia Transplantation into Visceral Defects with Special Reference to the Hollow Organs," the author modestly states that "no important new principle was employed in the methods of fascia transplantation that I practised. Defects were made as previous experimenters had made them, the same fasciae were transplanted, the technique was, in general, the same. The only explanation that can be offered for the satisfactory results obtained in types of experiments found unsuccessful in the hands of others is to be found in the *details* of the technique employed."

"The one significant difference was in the method of fixing the transplant at the defect. All previous experimenters sutured sheets of fascia *over* defects to the walls of the viscera beyond the cut margins. By this method they believed that the transplant would be best nourished from the cut edge of the organ and that it would offer the greatest resistance to tension and the least chances for leakage." "In my early experiments this method was followed." "It was found that leakage readily occurred between the surface of the organ and the adjoining surface of the transplant, and that the resistance to tension was not great." "Evidently a method was required that would prevent the cut margin of the organ from rolling back, would give sutures a firmer hold by being passed through *all* the layers of the organ, would invite the overgrowth of the lining mucous membrane of the hollow viscus, and would most readily supply provisional nutrition to the transplant. These requirements were met by suturing fascial sheets *into* visceral defects. The results of the application of this method were remarkably satisfactory, as will be seen in the various groups of experiments to be recorded." "The only additional differences in technique were in the method of suturing and of hemostasis. Concerning the latter, previous experimenters took pains to clamp and ligate bleeding vessels at the margin of the defects made in the organ." "Considerable devitalization was thus unavoidable, exactly where good nutrition was most desirable." "By implanting fascia *into* the defect, bleeding vessels could be readily caught in the fixating sutures and ligatures were not necessary." "It was also to diminish devitalization that these sutures were not placed as close together as others had advised." "Evidently, as a result of the method of hemostasis and application of sutures and, above all, of the method of implanting fascia *into* and not *over* the defect, *the successful outcome of many of the experiments could be anticipated with absolute certainty.*"

H. G. BEYER.

[1] Awarded the Biennial Prize for 1916 of the Alumni Association of the Columbia University College of Physicians and Surgeons, New York City.

BOOK REVIEWS

Victor Chapman's Letters from France, Memorial Edition, the Gift of John J. Chapman. The MacMillan Company.

An appealing memoir, the foreword of which is a tribute by his father, giving a complete insight into Victor's character and which is likely to be read with even greater interest after completing the book than in commencing it.

The letters themselves, written under the greatest difficulties in the trenches, while with the Foreign Legion, and later in more comfortable surroundings as a member of the American Escadrille, are full of his youthful, earnest spirit; he chafes under delays, is impatient when nothing is being done, lends a hand to help in every endeavor, is restless under discipline (which would not be necessary for him if it were not for example's sake), but always on hand for duty and doing more than his duty. He is a good comrade, making the most of the various characters with whom he is associated in the Foreign Legion, evidently looked up to by all, and appreciated by his officers. His innocence of military terms and of their English equivalents improves of course with his service, though perhaps "fatigue" always meant "chores" to him. His good nature and uncomplaining spirit never leave him and he makes the best of everything, without trying to do so and without affectation—he is there for a purpose. His frequent letters home show his affection and desire that the loved ones should not worry on his account.

"Flying for France," by James A. McConnell, is read to advantage in connection with these letters and throws many side lights upon them. While Victor was the first American aviator to fall, McConnell soon followed and Prince and Rockwell too, and now the papers announce the probable death of Bert Hall. How many of the original members of the organization survive, we know not; but we do know that the services of the American Escadrille have been invaluable to the allied armies, and its members have not died in vain.

George Andrews.

Diseases of the Genito-Urinary Organs and the Kidneys, by Robert Greene, M.D., Professor of Genito-Urinary Surgery at the Fordham University, New York; and Harlow Brooks, M.D., Professor of Clinical Medicine, University and Bellevue Hospital Medical Colleges. Fourth edition, thoroughly revised. Octavo of 666 pages, 301 illustrations. Philadelphia and London: W. B. Saunders Company, 1917. Cloth, $5.50 net; Half Morocco, $7.00 net.

Doctors Greene and Brooks are to be congratulated on the new edition of their poplar book, which is up to date. It is the fourth edition within seven years. The authors being each a specialist, the one in surgery, the other in medicine, are together able to discuss their subjects in a manner not unlike two well-grounded and experienced men in consultation, and the physician or surgeon referring to this book for counsel gets the benefit of such consultations. Too often the general practitioner is apt to become confused by the contradictory evidence presented in the current medical press. In the work before us

will be found a sane and logical summing-up of what is known of the subjects considered and the advice in treatment is expressed in comprehensive English. The book is well illustrated and the index a good one.

JNO. E. SUMMERS.

UROLOGY, DISEASES OF THE URINARY ORGANS, DISEASES OF THE MALE GENITAL ORGANS, THE VENEREAL DISEASES, by Edward L. Keyes, Jr., M.D., Ph.D. Appleton and Company, 1917.

This is a text-book of 900 pages with 204 illustrations and 18 plates, covering the principles of urology, gonorrhea, diseases of the urinary organs, diseases of the genital organs, operative surgery, and syphilis, which is discussed in an appendix.

It seems to the reviewer that this book has most of the virtues and some of the faults of books of this class. In a text-book one looks for a clear-cut exposition of the subject by a man of much experience, without confusing discussion of moot points or needless minutiae. The present work furnishes such an exposition. The writer has had both his own experience and that of his father to draw upon, and the book has a distinct personality.

On the other hand a book of this character necessarily presents chiefly well-established practice or beliefs rather than the newer ideas which have not yet gained general acceptance, which can only be discussed in current literature or in monographs. In spite of this general principle, much of the more recent work on such subjects as radiography, renal function tests and renal infections has been presented.

Again in a book of this character, and because of the wide field covered, the discussion of certain topics must remain rather sketchy. Thus but a paragraph is devoted to the treatment of syphilis of the nervous system. As the author evidently does not regard syphilis as properly belonging to the subject of urology, and has relegated this disease to an appendix, this may not be a fair criticism.

The book is well made, and may be recommended to those wishing a text-book covering this field.

E. B. VEDDER.

COMPENDIUM FOR MEDICAL OFFICERS, by Gilbert E. Seaman, Major and Chief Surgeon, Wisconsin National Guard. Published by Author.

This compendium, just published, is largely a compilation from the Act of June 3, 1916; from Army Regulations, as they affect the Medical Department; Tables of Organization; certain parts of the Manual for the Medical Department; the rules governing the physical examinations of recruits; and Field Service Regulations, as affecting the Medical Department, all official; together with chapters relating to hygiene, and one on ballistics. There are also chapters on the employment of the Red Cross, and the Articles of the Geneva Convention. In addition there is information as to the use of vaccine therapy and the Carrel-Dakin method of wound treatment.

There is, of course, nothing particularly original in the work, nor could there

be, but it presents a considerable amount of useful information for the medical officer, under one cover and in handy form. A few errors are noted, such as the incorrect spelling of the name of a well-known medical officer of our service, and the statement that "the field ration consists of the travel ration plus any supplies which can be obtained locally," no note being made of the reserve ration. The book would undoubtedly prove useful to the inexperienced medical officer and is a very creditable piece of work.

H. W. Jones.

Bulletin No. 105, U. S. Public Health Service, Hygienic Laboratory.

The first section of this bulletin is a series of studies in pellagra by John Sundwall, Assistant Surgeon, U. S. P. H. S.

With a view toward discovering whether there are any special specific changes peculiar to pellagra alone, Dr. Sundwall admirably describes in detail an exhaustive series of experiments conducted on monkeys, white rats, pigs and rabbits with various vegetable diets, deficient in essential constituents.

These experiments were closely followed throughout, careful autopsies performed and microscopical examinations made of all important tissues.

The final results were compared with the results of autopsies made on true pellagra cases in the human being. Comparisons compel us to conclude that, while the conditions are very similar in the two series of cases, all of them are attributable to malnutrition.

In other words, nothing at all was found that might be considered peculiar to pellagra which must still be classed as a disease of malnutrition along with rickets, scurvy, beri-beri, etc., until some important discovery is made that places it in a class by itself.

Sections 2 and 3 of the bulletin are by Edward Francis, Surgeon, U. S. P. H. S.

In section 2 Surgeon Francis describes his cultivation experiments with the blood and spinal fluid of pellagrins. These were laboratory experiments, carefully conducted, to determine whether there were possibly any anaerobic organisms concerned in the production of pellagra. The results were entirely negative in character.

In section 3 he describes further attempts to transmit pellagra to monkeys. Such attempts have been practiced since 1912 by the U. S. P. H. S.

They have been carried out by all conceivable methods, the injection of nerve tissues, injection of buccal, thoracic and abdominal organs, injection of intestines and contents, injection of skin containing the pellagrous lesions, injection of blood, of cerebrospinal fluid, collected during life, of pericardial fluid, of urine, of feces. Again, by intranasal application of untreated feces, feeding of sputum, of pellagrous tissues, of tissues and spoiled cornmeal, and also of feces and spoiled cornmeal.

It seems reasonable to believe that if there were anything specific about pellagra, at least one of these various methods of attempted infection would be provocative of a positive result, but, in spite of all, the results were uniformly negative.

The laborious work performed furnishes absolutely no support, as yet, that pellagra is an infectious disease.

Dr. Francis has written his researches in a thoroughly interesting manner and his labors have been of great value, inasmuch as they demonstrate that we are dealing with a disease of faulty dietary at least, our present knowledge of which does not permit us to class it among the specific infectious maladies.

Even negative results help along toward important discoveries, very frequently by elimination, and the saving of time for working along other lines.

GEO. J. NEWGARDEN.

HANDBOOK OF ANATOMY, by James K. Young, M.D., F.A.C.S., Professor of Orthopedic Surgery, Philadelphia, Polyclinic, etc. Philadelphia, Pa.; F. A. Davis Co. Price, $2.

Several changes have been made in this, the fifth edition of Young's complete synopsis of human anatomy, a book well known to the profession and particularly intended for the use of students and those preparing for examinations; among these is the addition of the Basle nomenclature.

The work is well illustrated with 154 prints, and most of the chapters are outlined in such a manner that the student can get a clear and concise idea of the context. The diagrammatic representations of the circulatory and nervous systems deserve special mention as being original and helpful. A new chapter on Dental Anatomy has been added which covers the embryology and anatomy of the teeth and jaws.

Young's Anatomy has been in use for the past twenty-nine years, has proved its value, and the author deserves credit for editing an up-to-date compendium of exceptional value.

DANL. L. BORDEN.

FIRLT AID TO THE INJURED AND SICK. An Advanced Ambulance Handbook, by F. J. Warwick, B.A., M.B. Cantab., M.R.C.S., L.S.A., A.K.C. Lond. and A. C. Tunstall, M.D., C.M., F.R.C.S., L.R.C.P., Ed. 10th edition, revised. 140th thousand. William Wood & Company, New York.

This has been for many years one of the very best books on First Aid; that it is in its tenth edition and 140th thousand amply demonstrates its popularity. The text is abundantly illustrated and revised to date.

CHARLES F. MASON.

REPRINTS AND TRANSLATIONS

THE MEDICAL SERVICE AND HOSPITALS OF THE BELGIAN ARMY[1]

(With eight illustrations)

INTRODUCTION

IN WAR time the Army Medical Service has a gigantic task. The natural feelings of humanity give into its care the work of helping the wounded, of securing hospital treatment to them at any moment, of tending the sick and the crippled, of bringing a little charity and sweetness into the sufferings of the soldiers; considerations of a strictly military nature render these obligations still more imperative. Upon their fulfilment depends the possibility of return to the front of men evacuated on account of wounds or illness. The Medical Service must also watch over the hygiene of the army, prevent the epidemics which were formerly more dangerous than the fighting, and contribute largely, by the confidence which it inspires, to the maintenance of the morale of the troops.

The large number of men called up by mobilization and the necessity of employing doctors, many of whom were little prepared for field service, tend to increase the difficulties. The Minister of War was therefore right when, at the moment of the reorganization of the army, in 1913, he tried by every means to raise the standard of the service and facilitate its means of action. The plan he had adopted was about to be realized when Belgium was obliged to defend her honor and her independence with an armed hand. In spite of the inconveniences caused by this situation, in spite of the obstacles that the carrying out of military operations was to present to the smooth workings of the service as it had been conceived (by compelling it to abandon all hospital buildings scattered over the country right down to the base of Antwerp), the Medical Service after eighteen months of war is worthy of the confidence of the authorities and fulfils, to the general satisfaction, all the duties which are laid upon it.

At the moment of mobilization (August, 1914) Dr. Melis, Inspector General of the Army Medical Service, had at his disposal 166 permanent military doctors, 520 reserve doctors, and 172 medical students. To this staff must be added 148 chemists, 965 orderlies and 1,850 stretcher-bearers, recruited from amongst those who were exempted in peace time.

The Medical Service had kept the immediate direction of the hospitals of Antwerp, Liège, Namur, Termonde, Beverlos, Brussels, Lou-

[1]Translation transmitted by a Military Observer.

vain, Malines and Vilvorde. All the other hospitals had passed under the direction of the Belgian Red Cross. On August 15, 50,000 beds, distributed among a large number of ambulances organized throughout the country, were at the disposal of the wounded. The resources of a prosperous country, the assistance of a numerous Medical Corps and of a devoted population, the variety of methods of transportation in a country where distances are short, all seemed to facilitate the mission of the Medical Service. But the war rapidly took a turn which belied that hope. The fall of Liège and Namur, the entry of the enemy into Brussels on August 20, the retreat of the army behind Antwerp and the extraordinary maneuver which enabled it to take up its position on the coast of Flanders, led to the loss of all the hospitals established in the country. Successive evacuations were to add to the difficulties of transportation, and to cause great loss of material. More than that, the repeated violation of the Geneva Convention by Germany was about to deprive our wounded, at the most critical moment, of many doctors and orderlies, made and held prisoner far too long in spite of the protestations of the Government.

In the middle of October, 1914, after two months of war the situation was as follows: the Belgian Army, escaping from the Duchy of Wurtemburg, had reached the neighborhood of the sea coast, after having abandoned Antwerp. Ostend and Zeebrugge had become temporary bases pending the complete rearrangement of all the services of the rear which were shortly to be installed in France.

All the transferable wounded of the hospital units of the district had been sent to the sea coast, where beds had been contrived for only two or three thousand men. Villas and hastily opened hotels sheltered about 13,000 sufferers, agonized at the idea of falling into the hands of the enemy and exhausted by painful transfer from one place to another. The Medical Service had been obliged to abandon the greater part of its immovable material, especially two-thirds of the outfit of the Central Pharmacy. Two hospital trains, one medical unit of the second army division and four of the fourth division had fallen into the hands of the Germans, and the number of the doctors was reduced to about 460, the enemy having kept a great number of them prisoner.

The evacuation of the wounded towards the coast could not go on continuously, because of the necessity of hiding from the enemy the operation that the high command, despairing of the fate of Antwerp, had audaciously conceived. The only available railroad had to be used primarily to save the provisions of the army; and trains, unknown to anyone, were passing by night through places that the enemy might easily have held under the fire of his guns. The wounded came next.

To all those evacuated from Antwerp had been added those sent out from Ghent. Their arrival on the sea coast demanded urgent measures.

The British Admiralty, when consulted, asked ten days for the embarkation of the wounded and their consequent withdrawal from all danger. But the pressure of the enemy, and the uncertainty at that moment as to when the junction with the Allies could securely be achieved, showed that it would be impossible to wait so long. The military authorities, on October 13, considered it absolutely necessary to gather into Ostend itself all the wounded scattered over the district to the north of that town. On the same day about 1,000 were sent to England on packet-boats, and the general evacuation began.

The government and general headquarters left the town; the night before panics had occurred in certain ambulances where patients had rushed pell-mell into the streets for fear of being deserted, in spite of the efforts of the staff. But the necessary means of transportation were found and sixteen hours later more than 13,000 wounded, sick and maimed were safely evacuated, thanks to the devoted assistance of the Allies; 8,500 men, in particular, were sent by railroad to Dunkirk (a harbor accessible to large ships), whence they embarked for England. Recourse was had to most unsuitable means of transportation, but "necessity knows no law." The fear of being made prisoners and the determination to go on fighting sustained the wounded and made them endure with courage the most cruel privations. Only a few hundred cases, absolutely too sick to be moved, remained at Ostend under the care of the Red Cross.

Three days later the Belgian Army, having taken up its position in that region of the Yser which it was destined to immortalize, was engaged in a fresh battle to check the rush upon Calais. It was facing towards its own country; in the rear, instead of the regular services ensured by the free disposition of national resources, there was now nothing but a congestion caused by the complete change of the base of operations. At the beginning the Belgian Army could not count upon any headquarters of its own and, in order to avoid overloading the entrenched camp of Dunkirk (exposed to immediate attack in case of the retreat of our lines), it was forced to carry back its first line of stationary hospitals to a spot 80 kilometers from its front.

On October 13 the first Belgian doctors arrived in Dunkirk and Calais, and the sick from depots evacuated towards France began to pour in immediately. On the sixteenth the Battle of the Yser began. Before the end of the month more than 12,000 newly sick and wounded were to be sent from the front to the base then in course of construction. The Belgian and French doctors, at the beginning, could hardly

do more than renew the dressings. The railways being congested by the movement of troops, it was decided to send the greatest number possible of wounded to England and to Cherbourg by sea route. Belgian state mail-boats, cargo-boats, transports of every kind, thus conveyed into safety 10,000 of the wounded. To Dunkirk were sent those whose condition demanded instant attention; those who could not bear the four hours' further journey to Calais; also the dying and the dead. From October 14 to November 6, 274 wounded were thus brought to Dunkirk, 37 having died on the journey.

Calais was crowded with wounded, sick and refugees; the inhabitants took into their homes men who were exhausted and crippled by the forced marches which the army had been obliged to make in the course of its dangerous retreat, and round the ambulances might be seen poor wretches waiting in the street for their turn to be looked after. The cathedral opened its doors to them and sheltered them in their sufferings. No praise is too great for the spirit of initiative, the devotion, the unbounded charity shown by our British allies during those hurried evacuations which brought into their harbors vast numbers of soldiers, many of whom demanded the most urgent attention. The hospitals of the British War Office alone received more than 25,000 wounded of all grades.

The Medical Service immediately set itself to the task. First the dangerously wounded who had been left at Dunkirk were sent to French hospitals. On October 17 one ambulance was opened in the schools of St. Pol-sur-mer; on December 22 the hospital ship *City of Antwerp* was requisitioned. At Calais the Mechanics' Institute was rapidly fitted up and became the first clearing hospital for the wounded.

On October 18 the Salon Richelieu, the Hospice of the Little Sisters of the Poor, and the ships *Paris* and *Ella* were fitted up as emergency hospitals, and in the fortnight that followed 25 other ambulances were opened at Calais. The Central Pharmacy, established on board the mail-boat *City of Liège* was again in working order, thanks to the generosity of the Belgian Hospital Fund, and began to cope with the scarcity of medicaments and dressings which was making itself cruelly felt. The French Army Corps gave 700 beds, but for many days the influx of wounded was so great that many had to remain lying upon straw in a pitiable state of destitution.

At the front the battle was raging hotly. The British field hospital stationed at Furnes gave the greatest possible help, but nothing could remedy the destitute condition of the rear units. Losses were increasing and the Field Hospital Service, in spite of its devotion, in spite of the admirable good-will of its members, found itself up against

almost insurmountable difficulties. The Belgian troops, hardly protected by light earthworks hastily thrown up, were subjected to a heavy fire and most of the wounds were very serious. In this exposed region, intersected by deep ditches, the passages which the evacuation service was obliged to use were often subjected to an intense and murderous bombardment.

The following report, taken from the notes of an officer wounded on October 25, gives an idea of the situation:

I was wounded in the arm on October 25, 1914, near the Yser Canal and was able to reach the temporary field hospital without the aid of stretcher-bearers. It was a real piece of luck, for how many of my comrades in arms had to wait until nightfall before being taken to the rear, and how many times did the enemy's shrapnel pursue the groups of wounded who were being carried out of the battle? I have known some who were dragged across the Beverdyke up to their shoulders in the water; others only escaped the furnace by crouching along the canal banks by the precarious aid of projecting stones. My fate was a happier one.

The temporary field hospital was at the Lettenburg Inn, 2½ kilometers to the rear. There was no way of reaching it except by the fields. As I neared the dyke, and though I was alone, salvos of shrapnel continually peppered the road; completely and entirely unsheltered as it was, there was no alternative route and the Germans were not at fault in bombarding it persistently. Within an area of about 1,500 meters I counted, on the paved part alone, more than 20 shrapnel shells of 75 or 21 cms.

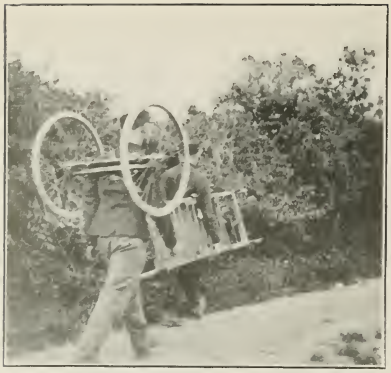
I walked through the meadows which were intersected by ditches, partly muddy, partly full of water. The impossibility of jumping, and the suffering which every jolt caused me, made me search for the muddy parts, which also served me as a shelter. I reached my commanding officer and to him I related my adventures before going on to the field hospital. This had been established in a room at the inn. The doctor painted my wounds with iodine and substituted a tightly bandaged dressing for the one which I had hastily devised out of a strap. A private English motor-car took me, together with another soldier, to Forthem, where a neighboring tramway took us on to Furnes. There were two or three hundred wounded in this convoy. At Furnes I learnt that the ambulances had just been evacuated and that the enemy had thrown six foot-bridges over the Yser near the bend of Tervaete. A train was made up from the wagons still at the station and filled to its utmost capacity. We were eleven in a third-class compartment, one of our number lying on the floor. The departure took place at about 6 p. m. and the journey was very long; the line was single track and at each station we had to wait for the passing of ammunition and reinforcement trains. The journey to Calais (about 70 kms.) lasted twelve hours.

Upon arrival the wounded were taken to the engine-house at Calais station. At last a thousand sufferers were lying there, side by side on narrow stretchers There was only one empty chair left. A nurse, whose features were haggard

Tombs of Belgian Soldiers on the Yser.

Tombs of Belgian Soldiers on the Yser.

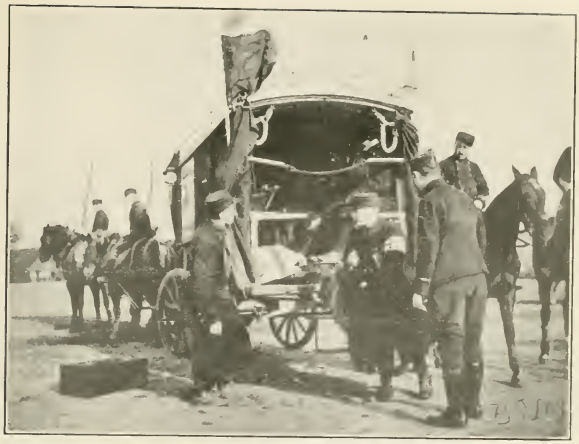
(To face page 500.)



Stretcher Bearers Going to the Trenches.

Cyclist Section of Stretcher Bearers.

Transportation of Wounded under Fire.



Ambulance Cars.

Wounded in Motor Ambulance.

Pitching of Tent.

with sleeplessness and fatigue, offered it to me. What made the deepest impression upon me was the silence of this room in spite of all the suffering crowded into it. We were given some hot coffee. Since the morning of the day before, with the exception of a little whisky which had been given me by the driver of the English motor ambulance, it was the only stimulant which I had been able to obtain, so great was the exhaustion of the resources of that region. The day came when I was taken to the harbor and embarked upon a mail-boat for England.

As everyone knows, on October 26 the Belgians opened the sluices at Nieuport and gave their country up to floods. For six days longer, while waiting for the water to rise to the desired level, they stood their ground and resisted desperately, and on October 31, with the aid of the Algerian riflemen, in a last bayonet attack they finally thrust out the Germans from Ramscappelle. Finally, on November 10, after four hours' hand-to-hand fighting, the enemy took possession of Dixmude. The front has changed but little since.

It is difficult to determine exactly what had by that time been achieved by the Medical Department. It is, however, known that the last thirteen days of October, 1914, 11,098 soldiers, of whom 9,050 were wounded, passed through the medical centers improvised during this period of crisis.

On October 18 there remained five wagon-loads of drugs, dressings and hospital appliances. The pharmacy gear and tools were left at Antwerp. Local resources were exhausted and agents were sent urgently to Paris and London to collect all available materials.

Refitting was difficult. In Paris the stores that existed at the beginning of operations had been taken for the French Army. Repeated demands soon drained the place dry. Motor-cars, traveling during the night, spent the day-time collecting from smaller shops what little still remained to them. In London purchasing was easier, but the channel crossing complicated the transport of goods and delays were considerable. However, in spite of the gravity of the wounds, only 418 deaths were registered out of 11,098 cases treated, that is to say, about 0.29 per cent.

The official number of deaths is not yet known, as men were often buried in haste where they were struck down; many also disappeared in the floods. Up to the present day the number of dead or missing during this period is 11,685, of whom 202 were officers.

But what is this little strip of native soil to which the Belgian Army clung so firmly, and upon which it was to pass two whole winters?

The battlefield is the old gulf of the Yser, the widest estuary off the ancient Flemish coast, extending as far as Loos. Conquered from

the sea in the thirteenth century it was only drained by the building of solid dykes and canals towards the sea to carry off the water coming from the inland districts and by systematically developing the "watergands" that, like the Kaslkofvaart or Beverdyk, carry down to the sea the waters of the interior. Until October, 1914, it was typical meadowland.

A large, green expanse without any trees or fences, not even a single bush at the entrance to the meadows upon which to hang a little shrine to the Madonna—that had to be fastened to the end of a stake driven into the earth. Nothing to be seen but a few large farms and the little white limewashed brick bridges crossing the watergands, few or no inhabitants: little scattered villages, like the town of Lampernisse, consisting of about twenty houses dominated by an enormous church.[2]

The climate there is damp all the year round. Fine days without mist are rare. On the contrary, the rains are long and slow, impregnating the region with moisture which only disappears by evaporation on this flat, impermeable ground, and which turn the clay of which it is composed into a sticky mud in which vehicles stick fast. Marsh fever still reigned there at the beginning of the last century. Mr. de Laveleye, traveling through this marshy district of Belgium, after the heat of July, 1859, found, in each farm, two or three persons exhausted by fever and heard, in every village, bells tolling for the dead. The lack of drinking water is still a cause of insalubrity.

All the wells are doubtful; near the surface the water is charged with impurities of all sorts; the depths are brackish. One must drink cistern water.

In November, 1914, in front of the line there stretched an immense lagoon where many floating corpses of men and animals were decomposing. Behind the lines the rain-water, baulked of escape, in many cases stole back the ground that had been won from the sea. Thus the Estuary of the Yser became once more a marsh as in the days of the Menapiens.

It was between the drier and healthier coastal regions which they occupied and the undulating downs towards Poperinghe that the allied armies had to live. There is no portion of the front where the sojourn of large numbers of men, deprived of the normal conditions of existence and exposed to all the vicissitudes of a forbidding climate, could have offered a condition more favorable to epidemics and more propitious to edemic maladies.

The moral depression inevitable after the days of violent action, the exigencies of a service that demanded the same work, the same fatigues from a regiment of men varying considerably in age and physical aptitude (our military organization was not yet accomplished and rapid mobilization had to treat many things crudely); the numberless difficulties of billeting, of food and

[2]Blanchard's "Flanders."

shelter, in a part of the country not made to receive armies in a winter campaign; the individualistic outlook of the soldier as yet little disciplined in the meaning of precautions against contagious diseases; the prolonged stay in the damp trenches full of water from the Yser; the rain, wind and cold at the beginning of December—all these conditions, united, were more than sufficient to give birth to many epidemics in addition to seasonal maladies.[3]

By this may be gauged the difficulty of the task which the Medical Service had to carry out, for if the difficulties of transportation inherent in the mobility of the troops and in the displacement of hospitals at the front grew less as the theater of operations remained more constant, yet the army was being maintained in a zone very dangerous to the health.

The part of the doctors and war surgeons was perhaps rendered easier. The mission of the hygienist, particularly, was enlarged—when the battle of the Yser came to an end winter was coming on and nothing was prepared for a prolonged stay in this ungrateful region. The troops lived in rain and mud under precarious shelters. They were only possessed of a very few single tents, mere pieces of impermeable linen about one meter square. The normal population of all this region is less than 30,000 souls; it was more than quadrupled, first by the army and afterwards by the return of the inhabitants who had fled before the invasion.

If the supply of food and ammunition were satisfactory the renewal of equipment gave place to much trouble. Change of linen was often lacking in the months of November and December, 1914. Shoes, already worn out after the incessant marching of September and October, no longer resisted the sticky mud of the Polder, a mud that is so tenacious that, in order to reduce to a minimum their carting, all the farm houses of the district are built in the middle of the fields which they cultivate. Drinking water was not to be found; wells were contaminated, cisterns insufficient.

The number of sick admitted to the hospitals increased considerably. In December, 1914, the proportion reached 1.78 per cent of the effective strength of the army; in January, 1915, 2.55 per cent. It was a distressing time, but the authorities acted with energy. The report of the actual situation will show the results. We will describe briefly the conditions of the soldier's life in the trenches and cantonments.

The Yser front includes many lines of defense. But it must not be understood, as was shown by many photographs of other sections of the western front, that they are composed of trenches, dug deeply into the ground.

[3]Report of the Bacteriological Department.

The presence at a very little depth of an aqueous substratum has forced the Belgian soldiers to build their entrenchments on the surface of the ground. One must imagine a sort of long wall, built of sacks of earth, sand or cement, piled up to a height and a thickness of several meters. Between these walls the passages alternate with rest-shelters contrived amidst piles of sacks. A low opening through which you can crawl gives access to a dugout where there is space for six or eight men. A straw bed is lying upon the wooden floor or even upon the hardened earth. A brazier of coke ensures to the inhabitants an atmosphere perhaps not very healthy but at least of a bearable temperature, while candles, fixed to wall by some ingenious device, shed a faint and flickering light. There the men sleep, read and write; others chat around the fire. Nobody seems to pay any attention to the inroads of the rats and mice which live there as if the place belonged to them. They would really be quite tolerable companions if they were not occasionally so greedy and so aggressively audacious. Such surroundings are certainly propitious to the increase of vermin. If "itch" has become less common, thanks to the energetic and efficient measures taken against this parasite, lice and fleas, on the other hand, have multiplied freely, as everybody can witness from first-hand personal knowledge. "I have never seen such a collection," one officer told me, though he had returned from the trenches with undiminished health and good humor. One can make a very determined effort to exterminate these pests, though their prolific breeding propensities to a great extent secure them from all chances of extinction. Does not a popular legend state that a flea becomes a grandmother in twenty-four hours?

This description of shelters for the men corresponds in every point with those for officers. There are no surroundings where equality is so well realized as in the trenches. Be the shelter called "Lodger's Villa," Shrapnel Palace," or "My Dream," all are lodged in precisely the same sort of hut. It is easily understood, therefore, how important is the care of general hygiene, reduced, under the circumstances, to questions of sheer cleanliness. The doctor's care must be particularly bestowed upon the shelters and their immediate surrounding. Disinfecting machinery is constantly at work. Lime, chloride of lime, creoline, etc., are widely used at infected or merely suspected spots. Petrol spread in the ditches and marshes destroys mosquitoes and their larvae. The results of these precautions are very satisfactory. Illness is relatively uncommon in the trenches.

But wounds of all possible degrees of gravity are frequently met with. Thus half of the Army Medical Staff is always present in the actual trenches, where first aid or medical units are constantly at work. The doctors are helped by company orderlies and stretcher-bearers. Formerly attached to ambulance columns, they have now been divided among the several battalions and actually accompany the fighters into the most advanced posts. The wounded thus receive immediate care while awaiting transportation to the nearest temporary field hospital. Unfortunately it very often happens that the transportation of wounded is delayed, for periods of time varying in length, by heavy gun-fire and bombardment. At the field hospital the first dressing is examined and done

up again in such a way as to permit the evacuation of the wounded. They are carried by hand on ordinary stretchers or on "Duthoit" wheel stretchers. In some sectors it is necessary to wait until night. Access to the trenches is only possible by means of connecting trenches or foot bridges over the floods. Any movement is easily seen and the passages are marked. The enemy's fire sweeps them on the slightest suspicion of movement. Out of 550 doctors included in the Army Medical Service 15 have been killed and 155 wounded, about one-third of the whole number.

Behind the lines are posts known as "dressing stations." These posts have been established at spots selected near roads accessible to carriages. Many field hospitals converge there. The wounded, after a last medical examination, are sent back to the hospitals under the charge of an orderly or sometimes of a doctor. Thanks to the network of telephones connecting up all parts of the front, the carriages arrive with the shortest possible delay. A first dressing applied quickly and well and a speedy evacuation have thus often saved the life of a wounded soldier whose case seemed desperate.[4]

From the dressing station the evacuated are sent to the infirmary of the division, where cases are sorted. The sick for whom care is needed, but who do not need to remain in the hospital, are kept there for treatment. The badly wounded and those not easily transportable occupy some of the 1,800 beds of the front hospitals. The others are sent to the evacuation hospital at the head of the railway line which brings them to the rear. The work of the Medical Department under the conditions which we have just related is not free from danger.

As we have seen before, the excess population of the Yser district has been very great ever since the first days of the battle. The troops were lodged as well as they could be in any available buildings. The arrangements were not at all comfortable. Lying on straw, often even on the ground, the soldier was only too happy to be protected against the inclemency of the weather. One can easily understand how such a situation might cause uneasiness with regard to the health of the men. Every effort was made to find a remedy, and the most popular solution of the problem was to establish wooden barracks with the floors raised from 20 to 30 cms. above the ground. The need for these barracks was all the greater because the continual bombardment of the buildings steadily reduced their number. Attempts were made to avoid ploughing through the mud by making wide wooden tracks. The hygiene service of the interior of the cantonments was thoroughly organized. Cleaning corps fought energically against vermin with pulverisators. Buildings contaminated by contagious diseases were evacuated and disinfected by means of the Hotton formal apparatus; the occupants of

[4]Dr. Sacre's Notes.

these buildings and even those who were only suspects were put into quarantine. But it was important not only to improve the quarters but also to facilitate to the greatest possible degree personal cleanliness among the men. The long duration of the war, the fatigues to be endured, the youth of many soldiers, the difficult conditions of life in the trenches have given an unique importance to everything that can minister to their well-being.

The generous help of many societies contributed largely towards these necessaries. Thirty shower-baths of the Pauliheac type were given to each large unit, and the Newman apparatus was also used to disinfect clothing. Four establishments with Nyssen shower-baths, given by the private initiative of six Belgian philanthropists, were scattered over the region. Situated in the very middle of the cantonments, they received the soldiers as soon as they returned from the trenches and gave them, after a bodily cleansing, clothing disinfected by steam sterilizers. During the first month of their use these installations provided 55,000 baths; now they have reached the number of 80,000. Two large military bathing establishments were founded further to the rear, and, thanks to the funds collected by Her Majesty the Queen, could hand out to soldiers emerging from the bath clean underclothing, either mended or new. The average number of baths per month in one of these establishments is 42,563. The figures for under-clothing, shirts, drawers, under-vests, handkerchiefs and socks are 124,000 new and 101,000 mended articles per month.

To these establishments are attached laundries where, besides the linen for the actual service of the baths, is washed the linen of half the army. A considerable staff of women is employed in this work, aided by other establishments at La Panne, Waton, Proven, Rousbrugge and Beveren, giving to women and young girls without other resources a remunerative occupation, capable of supporting them against the temptation of idleness.

Another serious problem was that of drinking water. By a strange irony the natural water of the district is not only a flood but also a danger; in its natural condition it is useless. The military authorities organized a daily relief system by means of cistern-boats and wagon-tanks. Generous help from outside made it also possible to distribute among the cantonment 160 sterilizers of the "Forbes" or "Lawrence" type, each capable of producing 160 liters of boiled water per hour. Finally, a philanthropic lady gave an auto-wagon producing 2,000 liters per hour, which was used to cope with any accidental local shortage of water. The drinking water, therefore, is very largely boiled water,

the absorption of which is rendered easy by the pronounced partiality which the Belgians have for coffee.

Field kitchens, supplied either by the War Department or by the Belgian Soldiers' Fund, were of great utility in this direction. To these precautions must be attributed the scarcity in the Belgian Army of the usual gastroenteric troubles prevalent in armies.

All these measures have rendered epidemics of contagious diseases very rare, except influenza, against which it is very difficult to take precautions; but the eruptive diseases, dysentery and cerebrospinal meningitis, are almost unknown. Not a single case of smallpox has been reported. As for typhoid, inoculation has been extended to the whole army ever since the arrival at the Yser. The number of cases was 1,996 and of deaths 280. Prophylactic measures have recently been completed by antiparatyphoid vaccination.

But the work of the Medical Department is not limited to this organization. From the arrival at the Yser up to January, 1916, 34,658 wounded and 26,172 sick—that is, some 60,830 patients—have been evacuated towards the rear. The hospitalization is another field of activity which must now be described.

(*To be continued*)

ASSOCIATION NOTES

THE ANNUAL MEETING OF THE ASSOCIATION AT FORT BENJAMIN HARRISON (INDIANAPOLIS) IND., OCTOBER 8–10 PROXIMO

A real soldier's meeting is promised the Association this year, something quite different from anything in all its history, for we are actually going into camp to taste again *la vie militaire.*

The program is shaping itself somewhat as follows: The members, many of whom it is expected will attend the meeting, are requested to report at the Medical Officers Training Camp, Fort Benjamin Harrison, on Sunday afternoon or evening, October 7. Colonel Ashburn, the Commanding Officer, invites us to bring our bedding and stay in camp; those of us who prefer taking quarters in Indianapolis, forty minutes distance from the camp by trolley, will find there ample hotel accommodations. The plan of assembling on Sunday will afford an opportunity to the members to be assigned quarters and get settled therein without loss of time, so that they may be ready for the first meeting on the following morning. Sunday night there will be a get-together Camp-fire Smoker, when old acquaintances can be renewed and new members met.

The Executive Council will meet Sunday evening at 7.30 at the camp, for the purpose of electing new members and transacting other routine business.

The first session of the meeting (all of the sessions will be held at the camp) will be on Monday morning, October 8, at 9 o'clock, when reports will be received from the Executive Council, Secretary-Editor, Treasurer, Auditor, Literary, Publication, Arrangements, Program, and Necrology Committees, also reports of special committees on Membership, Legislation, Sinking Fund, and other subjects. At this meeting the Nominating Committee will be appointed and amendments to the Constitution and By-Laws considered.

The second session of Monday will be held at 1.30 p. m. at which addresses will be delivered by Col. T. H. Goodwin, C.M.G., D.S.O., R.A.M.C., on "Practical Medical Military Lessons of the War," and Maj. Victor C. Vaughan, M. O. R. C., U. S. A., on "Coöperation of the Civilian Medical Profession with the Medical Services of the Governmen in time of War." A symposium on "How Medical Military Services of the Government May Best Coöperate in time of War" will be

given, the Army being represented by Col. L. A. La Garde, M.C., U. S. A. (Retired), the Navy probably by Med. Dir. Geo. A. Lung, U. S. N., and the Public Health Service by Assist. Sur. Gen. W. C. Rucker, U. S. P. H. S. Following this meeting a barbecue will be held, taking the place of supper at 6.00 p. m.

The third session at 7 p. m. will include an address by Col. Charles Dircle, Medical Department, French Army, on "Medical Service on the Western Front," illustrated by moving pictures; following which Lieut. Henry Haye of the French Army will lecture on "Trench Fighting."

The fourth session, Tuesday, at 9 a. m., will include addresses by Colonel Goodwin, Major Bloodgood and various papers by members of the Association.

The fifth session at 2 p. m. will be devoted to field demonstrations of medical department activities.

The sixth session at 7 p. m. will be the public meeting at which the chairman of the Committee on Arrangements will preside. The president of the Association will deliver his oration. Presumably a military band will be designated to furnish the music.

The final (7th) session will be held on Wednesday morning, the 10th inst., at 9 a. m. This will be a business meeting for the election and installation of officers and the transaction of unfinished business, after which the meeting will adjourn *sine die.*

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Obituaries

Capt. G. L. Painter, M. C., California National Guard, a member of the Association of Military Surgeons, U. S., died at his home in San Francisco, Cal., July 22, 1916. He was a graduate of the Medical Department, University of California.

Lieut. Col. Edwin Bently, Surgeon, U. S. Army, retired, a long-time member of our Association, died at his residence, 1200 McAmount Street, Little Rock, Ark., February, 5, 1917, after an illness of eight weeks. He was born in New London County ,Conn., July 3, 1824. He entered the Army in 1861 as Assistant Surgeon. At the close of the Civil War he had charge of all hospitals in Alexandria, Va., and by his untiring energy and enthusiasm in his profession rendered valuable government service. He retired for age July 3, 1888, was awarded the brevet of lieutenant colonel in 1865 for faithful and meritorious services during the war and was advanced to lieutenant colonel on the retired list for Civil War service in 1904. "In 1875," writes a correspondent, "he accompanied the Fourth Artillery to the Black Hills and during the Modoc War, in 1877. He checked the smallpox epidemic in New Orleans. From 1878 to 1884 he was post surgeon at Little Rock and medical director of the Department of Arkansas, and while there founded the medical department of the University of Arkansas, of which he was dean, and for nearly thirty years filled the chair of surgery. He was closely identified with the civil officers of Little Rock until his death. He was generous, charitable, and greatly beloved. He is survived by his wife and one son, Dr. Carle E. Bently. The interment was at the National Cemetery, Arlington, Va.

Capt. Brooks H. Wells, M. O. R. C., U. S. Army, a distinguished physician of New York and member of the Association, died in New York, July 6, 1917, as the result of an injury. He was greatly interested in the work of the Medical Reserve Corps and became a member of the same several years ago. Notwithstanding his age and the demands of his family and practice, together with his editorial duties and other activities, he nevertheless early accepted a commission and a few months ago was assigned to active service in the examination of recruits for the corps. Without giving expression to the same, Captain Wells nevertheless felt keenly his responsibilities to the service in which he was commissioned and was ready to respond to the call for active duty when this came. His decision and action should constitute a noteworthy example to the younger men of the profession of patriotism and devotion when the country calls for the services of its medical men. Although devoted to a specialty (obstetrics) far removed from the domain of military medicine and surgery, Dr. Wells bravely took up the work and regularly participated in the necessary drills and other methods of instruction. He was commissioned a captian in the Medical Officers' Reserve Corps only a few months ago and expressed a desire before his death to be laid away in the uniform of his rank. The wish was granted.

Col. George D. Deshon, Medical Corps, U. S. Army, a member of the Association and chief surgeon on General Edwards' staff of the Department of the Northeast, died suddenly on Sunday, June 24, 1917, within a short distance of the house in Brookline, Mass., where he was born fifty-three years ago. His wife saw Colonel Deshon totter and fall at her feet. He had been seeking the fresh air at an open window. A postmortem examination revealed heart failure as the cause of death. Colonel Deshon had a record for service during the Philippine and Cuban campaigns and at the Panama Canal Zone. Just before General Pershing sailed for England and France to prepare the way for the American expeditionary force of his command he wrote Colonel Deshon asking him to join his staff. Ill health, however, forbade the colonel's acceptance of the offer. Colonel Deshon was in poor health when he was transferred north from the Canal Zone and on arriving in Boston went to the Massachusetts General Hospital for treatment. He seemingly improved, but complained of attacks of indigestion and returned to the hospital for another examination, but the physicians were unable to find any organic trouble. He was born in Brookline on August 5, 1864. After attending Dartmouth College he entered West Point, and upon completion of his military instruction there he was appointed to the same regiment with General Edwards, the 23d infantry, at Fort Wayne, Detroit. Shortly after his marriage he resigned, in 1890, and studied medicine at Bellevue Medical College and the University of Pennsylvania. He practiced medicine for a time in Fall River and then reentered the Army as a surgeon. He went to the Philippines in the same transport with General Lawton and with General Edwards, who was chief of General Lawton's staff. Colonel Deshon returned to the states to become commandant of the Army and Navy general hospital at Hot Springs, Ark. He was then for two years professor of hygiene at Drake University, Des Moines, Iowa. Afterward he served in different capacities until appointed commandant of the U. S. canal hospital at Panama. When General Edwards was ordered to the command of the new Northeastern Department, Colonel Deshon and all others on General Edwards' staff at the canal applied for transfer with him. Colonel Deshon was the only one sent, and he reported in Boston shortly after General Edwards arrived. He was a member of the Army and Navy Club, Washington; the Psi Upsilon fraternity, the Society of Colonial Wars in the Commonwealth of Massachusetts, the Massachusetts Society of the War of 1812, Massachusetts Society of the Military and Naval Order of the Spanish War, Massachusetts Society of Sons of the American Revolution, and the Society of the Army of the Philippines, and he belonged to the Casino Union in Manila.

First Lieut. Augustus A. Greenburg, M. O. R. C., U. S. Army, a member of the Association, died in the Jewish Hospital, Brooklyn, from blood poisoning, following the bite of a mosquito, on August 6, 1917, aged 38 years. He was a graduate of the Long Island College Hospital in 1909, and on the visiting staff of Gouverneur, Mt. Sinai, and Beth Israel Hospitals. He was to have reported at Fort Benjamin Harrison on August 10, for duty under his appointment as first lieutenant in the Medical Officers' Reserve Corps.

Lieut. Col. Charles Billingslea, M. C., U. S. Army, member of the Association of Military Surgeons, U. S., died suddenly at Camp Meade, Md., August 16, 1917, aged 39 years. Colonel Billingslea, a scion of an old Maryland family, received the degree of A.B. from Western Maryland College and M.D. from the University of Maryland. He was commissioned first lieutenant in the Medical Corps of the Army, June 2, 1902, from that State, and attained the grade of lieutenant colonel after fifteen years' service. Colonel Billingslea recently returned from a tour of duty in the Philippines and was occupied in organizing the Medical Department of General Kuhn's Division at the date of his untimely death.

Capt. Charles H. Bowker, M. O. R. C., U. S. Army, a member of the Association, who was commissioned as a major and placed in command of the Field Hospital Service of the District National Guard before that organization was sent to the Mexican border last year, was drowned Sunday, September 9, 1917, in Roosevelt Lake, Ariz., while attempting to rescue a woman, who later was saved by other members of the party.

Captain Bowker came from an old New Hampshire family that has been prominent in New England history since the revolution. He was a graduate of Georgetown University and took an active and prominent part in humanitarian and patriotic work in Washington, in which city he made his home, going there from Whitfield, N. H., where most of his relatives reside.

At one time he was medical examiner in the pension office and later was medical director of the Gospel Mission, in which office he did a vast amount of good among the poor people of the national capital.

While the District National Guard was in camp at Fort Myer, preparatory to service on the border, he was promoted from captain to major and placed in command of the field hospital, succeeding Major Fales. After serving for eight months at Bisbee, Ariz., when the Field Hospital unit was about to be mustered out he accepted a position as superintendent of a mine hospital at Bisbee.

When the War Department again needed his services he accepted a commission as captain in the Medical Reserve Corps.

He was treasurer general for a number of years of the Order of Washington, of which Admiral Charles H. Stockton is the commander general. He resigned that office when he went to Arizona, and became state deputy commander for Arizona.

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Competition for 1917 will be based on essays on prescribed subjects which will be announced later.

Each competitor must furnish five copies of his competitive essay. Essays must not be signed with the true name of the writer, but are to be identified by a *nom de plume* or distinctive device. They must be forwarded to the Secretary of the Association of Military Surgeons of the United States, Army Medical Museum, Washington, D. C., so as to arrive at a date not later than **September 15, 1918,** and be accompanied by a sealed envelope marked on the outside with the fictitious name or device assumed by the writer and enclosing his true name, title and address. Essays must contain not less than 5,000 nor more than 20,000 words, exclusive of tables. The envelopes accompanying the winning essays will be opened at the annual, or other meeting, by the president, and the names of the successful contestants announced by him. The winning essays become the property of the Association and will be published in THE MILITARY SURGEON. The writers of the essays receiving "first honorable mention" will be awarded life membership in the Association of Military Surgeons, U. S.

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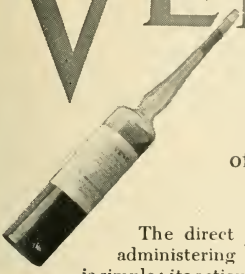

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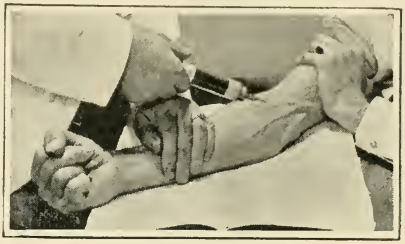

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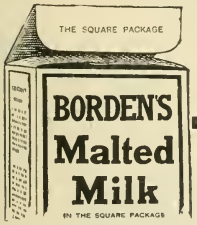

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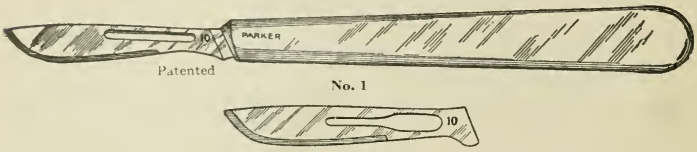

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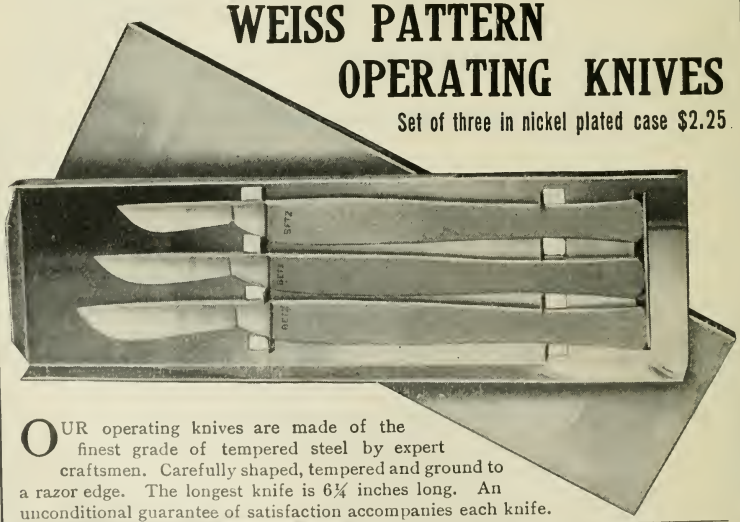

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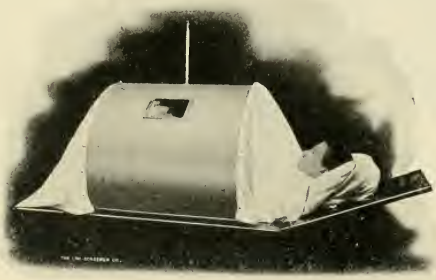

(*See American Journal of Surgery, September*, 1917)

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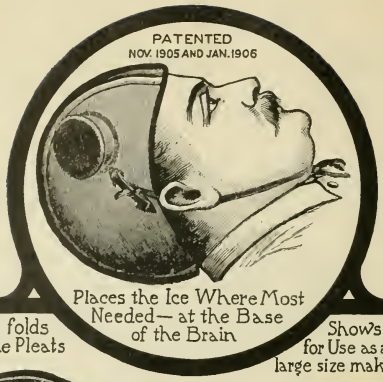

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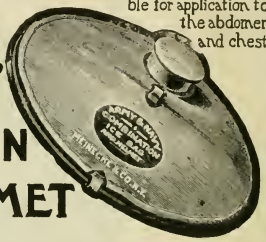

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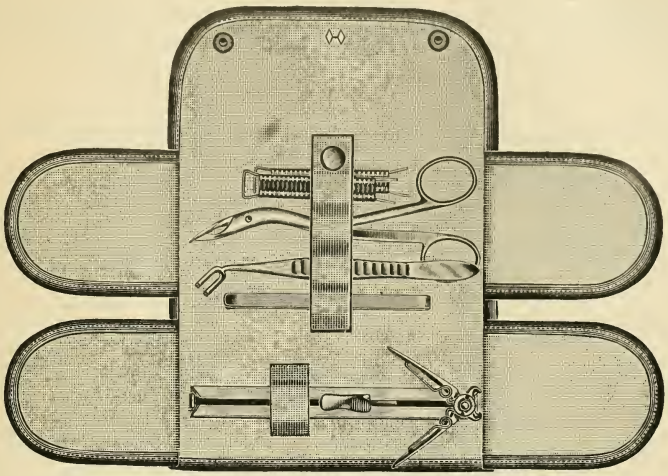

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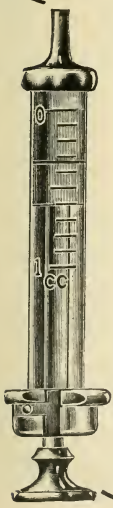

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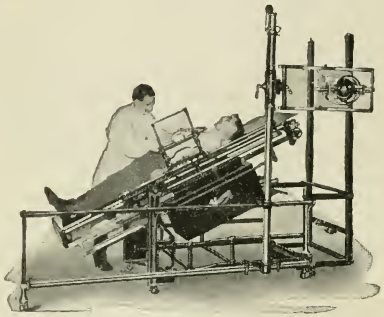

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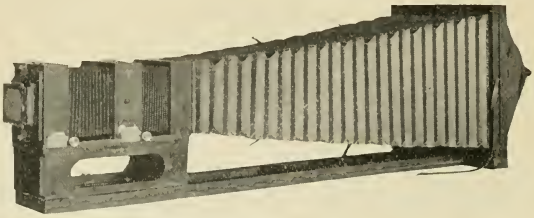

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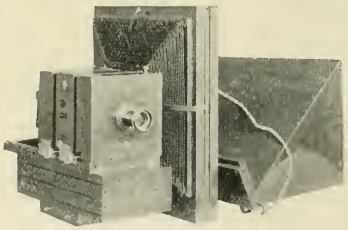

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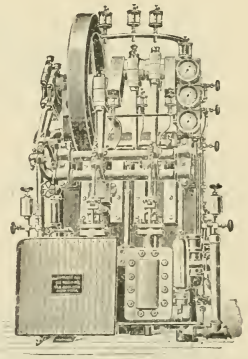

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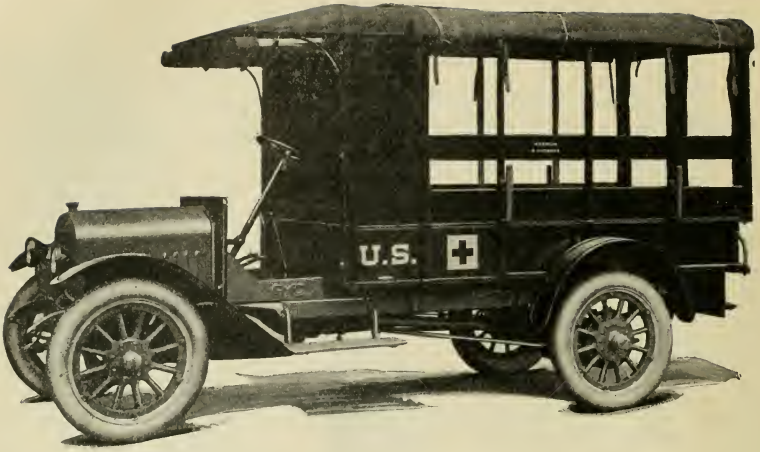

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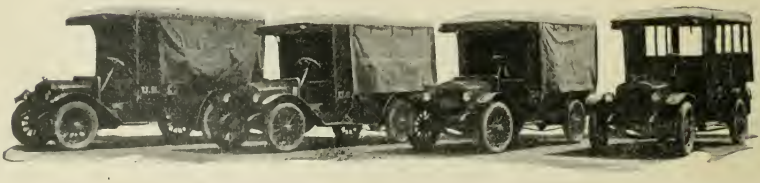

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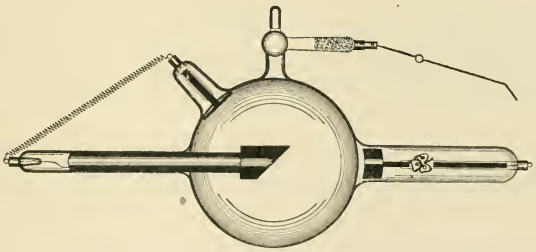

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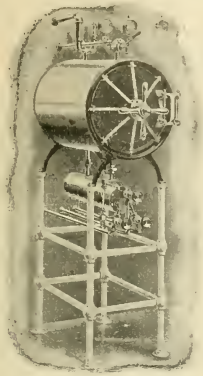

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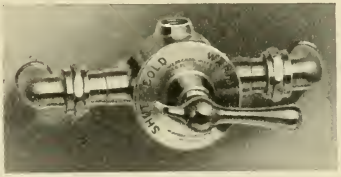

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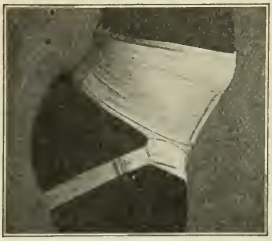

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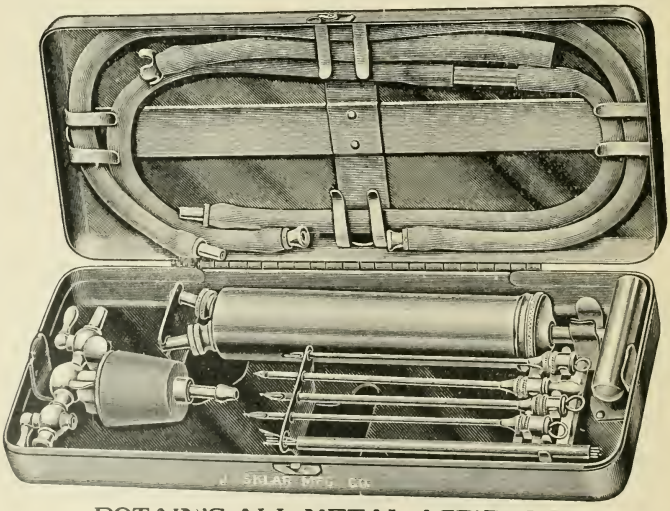

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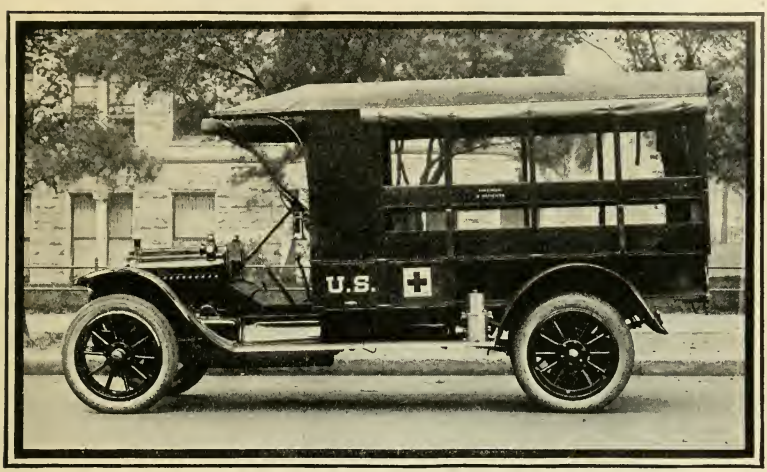

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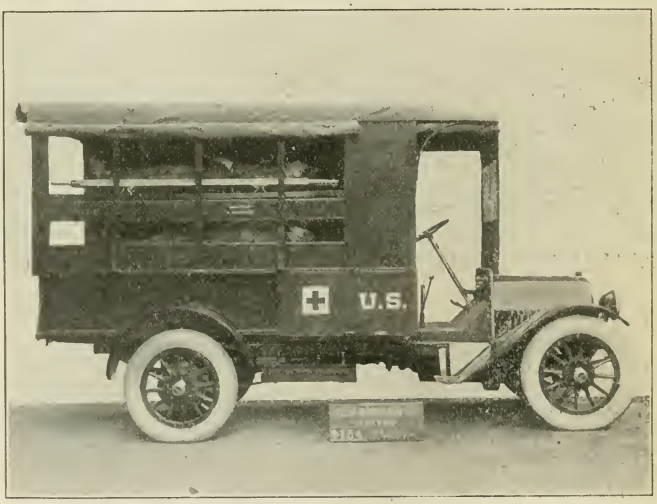

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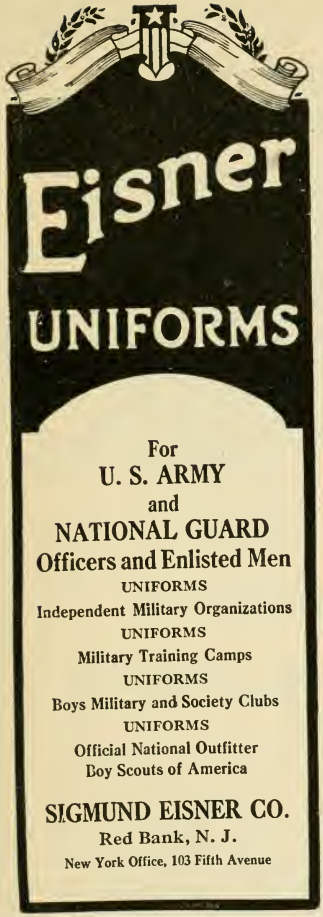

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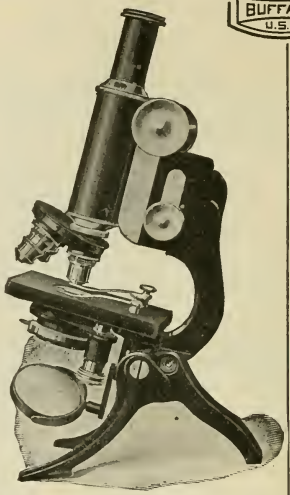

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